

# JOURNAL

ON THE

## ASIATIC SOCIETY OF BENGAL.



Vol. LXVIII. Part II.—NATURAL SCIENCE.

No. I.—1899.

*Materials for a Carcinological Fauna of India. No. 4. The Brachyura Cyclometopa. Part II. A Revision of the Cyclometopa with an Account of the Families Portunidae, Cancridae and Corystidae. By A. ALCOCK, M.B., C.M.Z.S., Superintendent of the Indian Museum.*

[Received 16th March. Read 5th April, 1899.]

In correction of my previously expressed opinion (*Journal* 1898, Vol. LXVII, pt. II, pp. 68 and 69) I now have no hesitation in accepting the limits of the Cyclometopa that have been fixed by Miers in *Challenger Brachyura*, pp. 106–215. I am not, however, in agreement with Miers subdivision of this great group.

It seems to me that Ortmann (*Zool. Jahrb., Syst., &c.*, VII, 1893–94 and IX, 1895–97) has struck out a much more natural classification of the Cyclometopa; but as he includes the *Parthenopidae* and excludes the *Corystidae*, I am unable to adopt it in its entirety. There can be little doubt, however, that Ortmann's conceptions of *Xanthini* and *Cancrini* agree with nature.

The present paper contains (1) a statement of my own views as to the classification of the Cyclometopa, and (2) diagnoses of the Indian genera and species of three of the constituent families, namely, the *Portunidae*, the *Cancridae* and the *Corystidae*.

The Indian species of *Portunidae*, as far as I know, number 67 or 68, of which 65 are represented in the Indian Museum: of *Cancridae* 4, all of which are in the Indian Museum: of *Corystidae* only one—a new species of *Nautilocorystes* dredged by the R. I. M. S. “Investigator.”

## Tribe CYCLOMETOPA, or CANCROIDEA.

*Cyclometopes*, *Telphusiens* and *Corystiens*, Milne Edwards, Hist. Nat. Crust. I, 264 and 363, II. 7 and II. 139.

*Cancroidea* and *Corystoidea*, Dana, U. S. Expl. Exped., Crust. pt. I, pp. 142 and 296.

*Cyclometopes* and *Corystiens*. A. Milne Edwards, Ann. Sci. Nat. Zool. (4) XIV, 1860, p. 185.

*Cyclometopa* or *Cancroidea*, Miers, Challenger Brachyura, pp. 106-215.

*Maioides-corystoidea*, pp. 26 and 28; *Cancroidea-portuninea*, pp. 27 and 65; and *Cancroidea-cyclometopa* (*Cancrini* and *Xanthini* only), pp. 412, 421, 428: Ortmann, Zool. Jahrb., Syst., etc., VII, 1893-94.

*Oxyrhyncha-corystidæ* and *Cyclometopa* or *Cancroidea* Ortmann, in Bronn's Thier-Reich V. ii. Arthropoda, pp. 1166 and 1165.

Carapace variable, either broader than long (almost all *Telphusidæ* *Xanthidæ* and *Portunidæ*, and some *Cancridæ*) or longer than broad (*Corystidæ* and most *Cancridæ*), the antero-lateral borders generally arched, sometimes very strongly so, the postero-lateral borders generally convergent, sometimes very strongly so. Front broadish or broad, horizontal or obliquely deflexed, occasionally prominent (but never forming a pointed rostrum with the basal antenna-joints for pillars as in the *Oxyrhyncha*).

Buccal orifice square-cut—only in the *Corystidæ* may its anterior angles be rounded off and a little convergent and its anterior boundary be indefinite: palp of external maxillipeds almost always articulating with the antero-internal angle of the merus.

Epistome transverse, never long fore and aft, sometimes linear and sunken (not distinguishable in the *Corystidæ*).

Antennules folding either nearly transversely or longitudinally.

Branchiæ nine on either side, their efferent channels opening on either side of the palate.

The abdomen of the male occupies all the space between the last pair of legs.

The genital ducts of the male open on the bases of the last pair of legs.

The *Cyclometopa* may be divided into the following 5 families:—

Family I. TELPHUSIDÆ. Carapace usually transverse, broader than long, subquadrilateral or oblate-oval, the antero-lateral borders short, the regions not well delimited (although the cervical suture may be deep and conspicuous) and never areolated. Front broad, not separated from the inner supra-orbital angles, obliquely deflexed (occasionally horizontal), commonly entire (occasionally lobed).



The antennules fold transversely in narrow fossæ.

The antennal flagella short.

• Epistome of fair length fore and aft, well demarcated and never encroached upon by the external maxillipeds.

Buccal orifice quadrate, a little elongate and a little bit rounded and contracted at the anterior angles.

Legs gressorial.

Sternum broad.

The Telpusidæ are the highest Cyclometopes, and approach the *Catometopa*. They appear to me, from consideration both of structure and of habitat, to have branched off from the Oziine or Eriphiine stocks, but are now inhabitants of fresh-water or damp jungle.

I do not propose to treat this family further, in this series of papers, until I have finished the other Brachyura.

Family II. XANTHIDÆ. Carapace transversely oval, or transversely hexagonal, or subquadrilateral, or (rarely) subcircular, but almost always broader than long; the regions very often, but by no means always, well defined and multi-areolate. Front broadish or very broad, oftener than not it is *not* sharply separated from the supra-orbital angles, often obliquely deflexed, usually showing a division into two lobes (each of which may, in some cases, show a further subdivision into two lobules).

The antennules fold either quite transversely or obliquely transversely.

Antennal flagella short or slender.

Epistome of fair length fore and aft, well demarcated, not encroached on by the external maxillipeds.

Buccal orifice quadrate, commonly broader than long.

Legs gressorial.

Sternum moderately broad—much narrower than in the *Telpusidæ*.

I have already in this *Journal*, Vol. LXVII, part 2, 1898, pp. 69–233, dealt with the family *Xanthidæ* in detail.

The family is there divided into the following 7 sub-families:—

Sub-family	I.	<i>Xanthinæ</i> , loc. cit.	p.	77.
„	II.	<i>Actæinæ</i>	„	p. 137.
„	III.	<i>Chlorodinæ</i>	„	p. 156.
„	IV.	<i>Menippinæ</i>	„	p. 177.
„	V.	<i>Ozinæ</i>	„	p. 181.
„	VI.	<i>Pilumninæ</i>	„	p. 190.
„	VII.	<i>Eriphiinæ</i>	„	p. 213.

In the *Ozinæ* and *Eriphiinæ* this family approaches the *Telphusidæ*: by the *Pilumninæ* and *Xanthinæ* it is linked with the section *Carcininæ* of the *Portunidæ* and, through these, with the *Cancridæ*.

Family III. *PORTUNIDÆ*. Carapace transversely hexagonal, sometimes subquadrate, occasionally elongate-obovate or even subcircular, but generally broader (typically much broader) than long, the regions often not well defined and seldom areolated. Front remarkably broad, generally well separated from the supra-orbital angles and almost always cut into teeth or lobes which are from two to six in number exclusive of the supra-orbital angles.

The antennules fold transversely or obliquely transversely.

The antennal flagella are almost always long and slender.

The epistome may be of fair length fore and aft, or may be linear: it may be, but is not usually, encroached upon by the external maxillipeds.

Buccal orifice quadrate, well defined anteriorly, usually, but by no means always, broader than long.

The last pair of legs are (with a few exceptions in which their dactylus is hook-like or is merely lanceolate) peculiarly modified for swimming, having at least the last two joints compressed, broadly-foliateous, and paddle-like.

Sternum broad.

This family is here divided into 4 sub-families, namely:—

Sub-family I. *Carcininæ* see ahead pp. 6, 7.

„ II. *Portuninæ* „ pp. 6, 7.

„ III. *Caphyrinæ* „ pp. 6, 8.

„ IV. *Lupinæ* „ pp. 6, 8.

The *Carcininæ*, by way of *Carcinus*, approach the *Xanthidæ*, by way of *Hoploxanthus*.

Family IV. *CANCRIDÆ*. Carapace either transversely oval (*Cancrinæ*) or, more commonly, elongate-oval or subcircular, the regions rarely strongly delimited and areolate. Front not very broad, very often cut into 3 (sometimes 2 or 4) sharp teeth, sometimes rather prominent.

The antennules fold longitudinally.

Antennal flagella usually long, coarse, and setaceous.

Epistome usually of fair length, often sunken, always overlapped, more or less, by the external maxillipeds, which are commonly, though not always, elongate. Buccal orifice quadrate, commonly a little elongate.

Legs gressorial.

Sternum narrow.

The family is here divided into 6 sub-families :—

Sub-family	I. <i>Cancrinæ</i>	see ahead	p. 95.
„	II. <i>Pirimelinæ</i>	„	p. 95.
„	III. <i>Thiinæ</i>	„	p. 96.
„	IV. <i>Atelecyclinæ</i>	„	p. 96.
„	V. <i>Acanthocyclinæ</i>	„	p. 96.
[? Subfamily	VI. <i>Trichiinæ</i>	„	p. 96.]

In the *Pirimelinæ* and *Thiinæ* this family approaches the *Carcininæ* among the *Portunidæ*; and by the *Atelecyclinæ* it is allied to the *Corystidæ*.

Family V. CORYSTIDÆ. Carapace a good deal longer than broad, elongate-oval, the regions fairly well defined or not, not areolated. Front rather prominent, not very broad, cut into 2 or 3 teeth.

The antennules are small and fold longitudinally.

The antennal flagella, when present, are long—sometimes longer than the carapace—coarse, and setaceous.

There is no epistome, and the maxillipeds, which occasionally have a pediform cast, are elongate and extend almost up to the antennules.

Buccal cavern rather elongate, its sides slightly convergent quite at their anterior end.

Legs either gressorial, or the last pair modified for swimming.

Sternum narrow and elongate.

In some of the genera of this group the antennal flagella are as long as the carapace and the dactyli of the legs are almost styliform: in others the dactyli are lanceolate—the last pair broadly so—and the antennal flagella are not more than half as long as the carapace.

The *Corystidæ* are the lowest *Cyclometopa* and have much the same relative position to the higher families of *Cyclometopes* as the *Raninidæ* have to the higher families of *Oxystomes*.

### Family PORTUNIDÆ.

*Portuniens*, Milne Edwards, Hist. Nat. Crust. I. 432: A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XIV. 1860, p. 195; and Archiv. du Mus. X. 1861, p. 310.

*Portunidæ* and *Platyonichidæ*, Dana, U. S. Expl. Exp. Crust. pt. I. pp. 267, 290.

*Portunidæ*, Miers, Challenger Brachyura, p. 169.

*Portuninea*, Ortmann, Zool. Jahrb., Syst., VII. 1893, p. 65.

Carapace depressed, or little convex (strongly convex in *Sphærocarcinus*), hexagonal, sometimes subquadrate, occasionally elongate-obovate or even subcircular, but generally broader (typically much broader) than long; the regions most often not well defined, seldom areolated;

the antero-lateral borders cut into teeth which are from 5 (very rarely 4) to 9 in number (in *Podophthalmus* and some species of *Euphyllax*, in which the antero-lateral borders are excavated for the enormously prolonged orbits, the number of teeth is reduced further).

Front remarkably broad, generally well separated from the supra-orbital angles, almost always cut into teeth or lobes, which are from 2 to 6 in number exclusive of the supra-orbital angles.

The antennules fold transversely or obliquely transversely.

Antennal flagella almost always long and slender.

The epistome may be of fair length fore and aft, or may be linear and sunken, but the palate is well defined anteriorly.

Buccal cavern quadrate, commonly broader than long, the merus of the external maxillipeds never decidedly elongate.

The last pair of legs are, with few exceptions, modified for swimming, having at least the last two joints compressed, greatly broadened, and paddle-like. (In *Caphyra* and *Sphærocarcinus* the last pair of legs are much like the other three pairs, are subdorsal, and end in a hook-like dactylus. In *Carcinus*, *Nectocarcinus* and *Portumnus* the dactylus of the last pair of legs is merely lanceolate).

I would propose to divide the Portunidae into four sub-families:—

1. Sub-family *Lupinæ*. The chelipeds are longer, usually much longer, than any of the legs, the first three pair of which have a tendency to be slender and the last pair of which end in typical swimming-paddles: the antero-lateral borders of the carapace are cut into from 5 (very rarely 4) to 9 distinct teeth. The carapace *may* be subrotund, but it is usually conspicuously broad.

2. Sub-family *Caphyrinæ*. The chelipeds and legs are short, but the chelipeds are distinctly, if only slightly, longer than the legs. The carapace is either as long as broad or very little broader than long, and is either smooth or is traversed on either side by a single ridge running inwards from the last of the (4 or) 5 teeth or puckers into which the antero-lateral border is divided. The last pair of legs are either swimming-paddles or are subdorsal and end in a prehensile dactylus.

3. Sub-family *Portuninæ*. The legs often have a tendency to be stout, and at least one pair of them is at least as long as the chelipeds: the last pair are typical swimming-paddles. The carapace is seldom very broad and its antero-lateral borders are cut into 5 teeth. The basal antenna-joint may be either fixed or movable: it is seldom broader than long, often longer than broad, and lies almost in the longitudinal axis of the carapace.

4. Sub-family *Carcininæ*. The legs have a tendency to be stout, and at least one pair of them is at least as long as the chelipeds: the



last pair end in a lanceolate dactylus and otherwise do not differ much from the other three pairs. Carapace not at all broad, its antero-lateral borders cut into 4 or 5 teeth. The basal antenna-joint is fixed: it is longer than broad and lies in the longitudinal axis of the carapace.

#### Sub-family I. CARCININÆ.

This sub-family comes nearest to the other Cancroid families. Of its constituent genera *Carcinus* touches the Cancridæ and Xanthidæ, *Nectocarcinus* touches the Xanthidæ, and *Portumnus* touches the Corys- tidæ.

It may be divided into two Alliances:—

Alliance 1. *Portumnoida*. Carapace as long as broad: antennæ setaceous: crests of endostome? For the single genus.

*Portumnus*, Leach, Malac. Pod. Brit. text of pl. iv. (= *Xaiva*, Macleay in Smith's Ill. Annulosa S. Africa, p. 62).

Alliance 2. *Carcinoida*. Carapace broader than long: antennæ not setaceous, the basal antenna-joint fixed: the palatal crests defining the efferent branchial channels are either interrupted or completely wanting. Constituent genera:—

1. \**Carcinus*, Leach.

2. \**Nectocarcinus*. A. Milne Edwards, Ann. Sci. Nat. Zool. (4) XIV. 1860, pp. 220, 228; and Archiv. du Mus. X. 1861, p. 404.

#### Sub-family II. PORTUNINÆ.

The material at my disposal is not sufficient to enable me with any confidence to separate the genera of this sub-family into groups, so that the following classification is meant to be merely a suggestion.

Alliance 1. *Portunoida*: The last pair of legs are typical swimming-paddles: the basal antenna-joint may be either fixed or movable: the palatal crests defining the efferent branchial channels may either be distinct and complete or be wanting. Constituent genera:—

1. *Bathynectes*, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 145 (= *Thranites*, Bovallius, Ofversigt Kongl. Vetensk.-Ak. Forhandl. 1876, No. 9, p. 61).

2. \**Benthochascon*, Alcock.

3. \**Liocarcinus*, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 146 (footnote).

4. \**Ovalipes*, M. J. Rathbun, Proc. U. S. Nat. Mus. XXI. 1898, p. 597 (for *Platyonychus* as restricted by Miers, Challenger Brachyura, p. 201; = *Anisopus* DeHaan Faun. Japon. Crust. p. 12).

5. \**Parathranites*, Miers, Alcock.

6. *Polybius*, Leach, Malac. Pod. Brit. text of pl. ix. B: and Milne Edwards, Hist. Nat. Crust. I. 438.

7. \**Portunus*, Fabr.: Milne Edwards, Hist. Nat. Crust. I. 439.

Alliance 2. *Cænophthalmoida*. As *Portunoida*, but the inner infra-orbital angle is fused with the inner supra-orbital angle. For the single genus.

*Cænophthalmus*, A. Milne Edwards, Miss. Sci. Mex. Crust. p. 237.

### Sub-family III. CAPHYRINÆ.

The genus *Lissocarcinus* connects this sub-family, by means of *Thalamonyx*, with the Lupinæ. *Caphyra* is another link with the Lupinæ, and *Sphærocarcinus* connects *Lissocarcinus* and *Caphyra*.

The three constituent genera are as follows, and, in my opinion, each genus is equivalent to an "alliance" in the other sub-families:—

1. \**Lissocarcinus*, Adams and White. The basal antenna-joint has its antero-external angle produced to touch the front and occlude the orbital hiatus—much as in *Charybdis* (= *Goniosoma*): the last pair of legs are swimming paddles.

2. *Sphærocarcinus*, Zehntner, Rev. Suisse Zool., Ann. Mus. d' Hist. Nat. Genève, II. 1894, p. 163. As *Lissocarcinus*, but the last pair of legs are as in *Caphyra*, and the carapace is *very strongly convex*.

3. \**Caphyra*, Guérin, Ann. Sci. Nat. XXV. 1832, pp. 285, 286 (= *Camptonyx*, Heller SB. Ak. Wien, XLIII. 1861, i. p. 357). The last pair of legs are subdorsal in position, are almost similar to the other legs and end in a hook-like dactylus. The basal antenna-joint is as in *Charybdis* (= *Goniosoma*).

### Sub-family IV. LUPINÆ.

The genera of this sub-family fall into the 3 following alliances:—

Alliance 1. *Lupoida*. The basal antenna-joint is short and squat and decidedly broader than long; or it has its greatest diameter transverse, or obliquely transverse, owing to the extension of its antero-external angle towards or into the orbit or up to the front.

The chelipeds are usually very much longer than the legs, of which the first 3 pairs have a tendency to be slender and the fourth pair usually has the last four joints much broadened.

The carapace is usually decidedly transverse with the antero-lateral borders longer than the postero-lateral, and is very often crossed by a few long definitely-placed transverse ridges, of which one that arches inwards from the last tooth or spine of the antero-lateral border on either side is the most constant.

The genera that constitute this Alliance are the following:—

1. \**Charybdis*, De Haan (or *Goniosoma*, A. Milne Edwards) with subgenera \**Gonioneptunus* Ortmann and \**Goniohellenus* (nov.).

2. *Cronius*, Stimpson, Ann. Lyc. Nat. Hist. New York, VII. 1860, p. 225 (*Charybdella*, M. J. Rathbun, Proc. Biol. Soc. Washington, XI. 1897, p. 166).

3. *Lupa*, De Haan, Faun. Japon. Crust. p. 11: A. Milne Edwards, Archiv. du Mus. X. 1861, p. 351 (*Lupella*, M. J. Rathbun, *tom. cit.* p. 155).

4. \**Neptunus*, De Haan (*Portunus*, M. J. Rathbun, *tom. cit.* p. 155, *nec auctorum*) with sub-genera \**Achelous*, \**Amphitrite*, \**Callinectes*, \**Hellenus* (including \**Xiphonectes*) and \**Lupocycloporus* (nov.).

5. \**Seylla*, De Haan.

6. \**Thalamita*, Latreille: with sub-genus *Thalamitoides* A. Milne Edwards, Nouv. Archiv. du Mus. V. 1869, p. 146.

7. \**Thalamonyx*, A. Milne Edwards.

[8. *Hedrophthalmus*, Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 67].

Alliance 2. *Podophthalmoida*. As *Lupoida*, but the eyes are borne on basal stalks of enormous length and the orbits are continued along the whole of the antero-lateral borders of the carapace.

The genera that constitute this Alliance are:—

1. \**Podophthalmus*, Lamarck.

2. *Euphyllax*, Stimpson, Ann. Lyc. Nat. Hist. New York, VII. 1862, p. 225.

Alliance 3. *Lupocycloida*. The basal antenna-joint, though not long, is rather slender and does not lie transversely or have its antero-external angle produced to any extent.

The chelipeds are considerably, sometimes very much, longer than any of the legs, of which the first three pairs are slender.

In the fourth pair of legs the last two joints are much broadened, but the merus and carpus *may be* slender.

The carapace is of no very remarkable breadth, the antero-lateral borders are about as long as the postero-lateral, and at least one transverse ridge is present on either side.

Two genera enter into this Alliance, namely,

1. \**Carupa*, Dana (in which the merus and carpus of the last pair of legs are not broadened).

2. \**Lupocyclus*, Adams and White (in which the merus and carpus of the last pair of legs may either be broadened or not).

In the preceding scheme of classification the Indian genera are printed in Roman type and the genera known to me by autopsy are marked with an asterisk.

*Key to the Indian genera of the Sub-families Carcininæ and Portuninæ.*

- A. Propodite of the last pair of legs merely dilated, the dactylus lanceolate..... CARCINUS.  
 B. Propodite of the last pair of legs typically foliaceous and paddle-like:—  
 1. Carapace smooth; orbits with two very indistinct grooves in the upper margin: arm short, without spines: legs stout..... BENTHO-HASCON.  
 2. Carapace with definitely-disposed tubercles; orbits with two open fissures in the upper wall: arm longish, with a spine or spines: legs slender..... PARATHURANITES.

*Key to the Indian representatives of the Sub-family Caphyrinæ.*

Chelipeds and legs short: carapace as long as broad or not much broader than long, smooth or with a single transverse ridge on either side: eyes and orbits normal: fronto-orbital border very much less than the greatest width of the carapace: antero-external angle of basal antenna-joint produced to meet the front and fill the orbital hiatus to the exclusion of the flagellum: front cut into two broad lobes besides the inner supra-orbital angles, or subentire..... LISSOCARCINUS.

*Key to the Indian Genera of the Sub-family Lupinæ.*

- I. The eyes, eyestalks, and orbits are normal in size and position:—  
 A. The extent of the fronto-orbital border is decidedly less, and is commonly very much less than the greatest breadth of the carapace, so that the antero-lateral borders are oblique and more or less arched. The antennal flagellum is near the orbital hiatus and sometimes in it:—  
 1. The antero-external angle of the basal antenna-joint not appreciably produced, the flagellum standing in the orbital hiatus:—  
 i. Carapace very decidedly broader than long, its antero-lateral borders cut into seven rather irregular teeth..... CARUPA.  
 ii. Carapace little broader than long, its antero-lateral borders cut into nine teeth which are alternately large and small (the small teeth sometimes obsolescent) .. LUFOCYCLUS.



2. The prolongation of the antero-external angle of the basal antenna-joint is small and lies in the orbit, the flagellum standing in the orbital hiatus: antero-lateral borders of carapace cut into nine large teeth:—
- i. Hand inflated and almost smooth: surface of carapace almost always in some way broken.....
  - ii. Hand prismatic and costate: surface of carapace smooth and unbroken.....
3. The prolongation of the antero-external angle of the basal antenna-joint is large and fills up either all or the greater part of the orbital hiatus:—
- i. The prolongation of the basal antenna-joint does not reach the front, so that the flagellum stands in the upper part of the orbital hiatus: other characters as in *Charybdis*.....
  - ii. The prolongation of the basal antenna-joint fills up all the orbital hiatus to the complete exclusion of the flagellum:—
    - a. Front cut into six lobes or teeth besides the inner supra-orbital angles: antero-lateral borders cut into six teeth.....
    - b. Front cut into two broad lobes besides the inner supra-orbital angles: antero-lateral borders cut into five teeth.....
- B. The extent of the fronto-orbital border is nearly equal to the greatest breadth of the carapace, so that the antero-lateral borders of the carapace are nearly at right angles with the front: the prolongation of the basal antenna-joint that meets the front and occludes the orbital hiatus is so long that the flagellum is far distant from the orbit. The antero-lateral borders are cut into five teeth of which the fourth is often small, or rudimentary, or sometimes obsolete....
- II. The eyes are borne on basal stalks of enormous length, and the orbits extend along the entire length of the antero-lateral borders of the carapace.....

SCYLLA.

NEPTUNUS.

GONIONOPTUNUS.

CHARYBDIS  
(= GONIOSOMA).

THALAMONYX.

THALAMITA.

PODOPHTHALMUS.

## Subfamily I. CARCININÆ.

## CARCINUS, Leach.

*Carcinus*, Leach, Malac. Podophth. Brit. Text of pl. V.: Desmarest, Consid. Gen. Crust. p. 90: Milne Edwards, Hist. Nat. Crust. I. 433: De Haan, Faun. Japon. Crust. p. 13: Bell, British Stalk-eyed Crust. p. 75: A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XIV. 1860, pp. 228, 266; and Archiv. du Mus. X. 1861, p. 390.

*Carcinides*, M. J. Rathbun, Proc. Biol. Soc. Washington XI. 1897, p. 164 (*new name proposed*).

Carapace approaching the hexagonal, not broad, slightly but distinctly convex, the regions fairly well-defined (well-defined for a Portunoid), no distinct transverse ridges.

Front proper fairly well defined from the inner supra-orbital angles beyond which it projects slightly, three lobed, between a fourth and a fifth the greatest breadth of the carapace in width.

Antero-lateral borders thin, oblique, arched, cut into five teeth including the outer orbital angles, shorter than the postero-lateral borders.

Orbits with one faint notch in the upper and one in the concave lower border, the inner angle of the lower border dentiform but not very prominent. The antennules fold obliquely, but nearer the transverse than the longitudinal.

Basal antenna-joint slightly longer than broad, fixed; the flagellum, which is not very long, stands in the orbital hiatus.

Buccal cavern square, its greatest length a little more than its greatest breadth: the external maxillipeds are rather elongate, especially the merus which projects somewhat beyond the level of the edge of the endostome: epistome lozenge-shaped. The ridges that define the efferent branchial canals do not approach the edge of the endostome.

Chelipeds massive, just shorter than any of the first three pairs of legs, slightly unequal: arm short, without any spines: inner angle of wrist alone spiniform: no spines on the hand, which is deep and not prismatic: fingers stout, a little shorter than the palm, not very strongly toothed.

Legs stoutish: the last pair have the merus elongate and unarmed, the carpus not dilated, the propodite shortened and somewhat broadened, and the dactylus acutely lanceolate.

The abdomen of the male consists of five pieces, the 3rd-5th terga being fused.

*Carcinus* exhibits the relation of the Portunidæ to other Cyclo-metopan families, being related to *Pirimela* among the Cancridæ and to *Hoploxanthus* among the Xanthidæ.

1. *Carcinus menas*, (Linn.).

*Cancer marinus sulcatus*, Rumph, Amboinsch. Rariteitk. pl. vi. fig. O.

*Cancer menas*, Linnæus, Fauna Suecica p. 492; Mus. Ludov. Ulric. p. 436; and Syst. Nat. (xii) I. p. 1043: ["Pennant Brit. Zool. IV. p. 3, pl. iii. fig. 5" sec. Milne Edwards]: Baster, Naturkundige Uitspanningen Zeeplanten en Zee Insekten, Haarlem 1765, II. pl. ii. figs. 1-3: Herbst, Krabben, I. ii. 145, pl. vii. fig. 46: Fabricius, Ent. Syst. II. p. 450, and Suppl. p. 334: Bosc, Hist. Nat. Crust. I. p. 173, pl. iii. fig. 1: Latreille, Hist. Nat. Crust. V. p. 363: Risso, Hist. Nat. Crust. Nice, p. 12: Lamarek, Hist. Nat. Anim. sans Vertèbr. V. Crust. p. 270: Dumeril in Dict. Sci. Nat. XI. 1818, p. 299: de Brobisson, Mem. Soc. Linn. Calvados, 1825, p. 233.

*Portunus menas* ["Leach, Edinb. Encycl. VII. p. 390" sec. Milne Edwards]: Costa, Faun. Regn. Napoli, Crust. Brach. p. 7.

*Carcinus menas*, ["Leach, Edinb. Encycl. VII. p. 429" sec. Milne Edwards]; and Trans. Linn. Soc. XI. 1815, p. 314; and Malac. Pod. Brit. pl. v: Desmarest, in Dict. Sci. Nat. XXVIII. 1823, p. 217; and Consid. Gen. Crust. p. 91: Risso, Hist. Nat. Eur. Mérid V. Crust. p. 7: Audouin, Explic. p. 84: Savigny Descr. Egypt. Crust. pl. iv. fig. 6: Milne Edwards in Cuvier Règne Anim. pl. x. fig. 3 and Hist. Nat. Crust. I. 434: ["Gould, Report on the Invertebrata of Massachusetts, p. 321" sec. A. Milne Edwards]: De Kay, Zoology of New York, pt. VI. Crust. p. 8, pl. v. figs. 5, 6: Lucas, Hist. Anim. Art. in Expl. Sci. Algerie, Zool. I. i. p. 13; and Hist. Nat. Anim. Art. p. 95: Bell, British Stalk-eyed Crust. p. 76: Salter, Journ. Linn. Soc., Zool., IV. 1860, p. 34 (*process of moulting*): A. Milne Edwards, Archiv. du Mus. X. 1861, p. 391: Van Beneden, Rech. Faun. Litt. Belg. p. 133: Heller, Crust. Sudl. Europ. p. 91, pl. ii. figs. 14, 15; and Novara Crust. p. 30: W. C. McIntosh, Trans. Linn. Soc. XXIV. 1864, p. 79, pl. xix., xx. (*on the various kinds of hairs*): Sars, vide Zool. Rec. III. 1866, p. 224: Nardo, Annot. Crust. p. 87: Wood-Mason, Proc. Asiatic Soc. Bengal, 1873, p. 172, and Ann. Mag. Nat. Hist. (4) XII. 1874, p. 405: Brocchi, Ann. Sci. Nat. (6) II. 1875, Art. 2, p. 62, pl. xvi. figs. 89, 90, 100, 101. (*male parts*): Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 109: Meinert, Nat. Tids., Copenhagen, (3) XI. 1877, p. 222, and (3) XII. 1879, p. 507: Kingsley, Proc. Ac. Nat. Sci. Philad. XXX. 1878, p. 321, and XXXI. 1879, p. 398; Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 56 (*gastric teeth*): Boas, Stud. Decapod. (Vid. Selsk. Skr. (6) I. 2) p. 141: S. I. Smith, Trans. Conn. Acad. V. p. 34: Carrington and Lovett, Zoologist (3) VI. 1882, p. 12: Carus, Prodr. Faun. Medit. I. p. 518: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 222: Mobius, SB. AK. Berl. 1893, pp. 75, 76: Ortman, Zool. Jahrb. Syst., etc., VII. 1893-94, p. 423: Birula, Ann. Mus. Zool. Petersb. 1897, p. 448.

Carapace about three-fourths as long as broad, the regions fairly well defined, the gastric being divided into three areolæ, the surface finely granular, especially in the anterior half.

Front cut into three lobes, of which the middle one is acuminate.

Antero-lateral borders rather shorter than the postero-lateral, cut into five anteriorly-acuminate teeth. Posterior border forming a curve with the postero-lateral borders.

Orbits without any particular dorsal inclination, their major diameter about half the width of the inter-orbital space. Antennal flagella about  $1\frac{1}{2}$  times the length of the orbit.

Chelipeds a little unequal, the longer one is less than  $1\frac{1}{2}$  times the length of the carapace: the inner angle of the wrist is spiniform and there are two costæ along the upper surface of the hand, otherwise they are smooth and unsculptured. Palm deep and full, but not inflated, fingers stout, nearly as long as the palm in the shorter cheliped only.

Legs stout, smooth, unarmed: the 2nd and 3rd pairs, which are the longest, are about  $1\frac{2}{3}$  times the length of the carapace: the fourth pair, which are also slightly longer than the larger cheliped, are a little shorter than the first pair.

Sixth abdominal tergum of male about twice as broad as long, with gradually convergent sides.

In the Indian Museum is a single male from Galle (Ceylon), besides numerous specimens from the Mediterranean and the North Sea.

The geographical distribution of *Carcinus mænas* has been referred to by several of the authors above-cited. The species has been found at various places on the Atlantic coast of the Northern United States and off the coast of Pernambuco (Brazil): it is the common shore-crab of the British Islands, and occurs in the North Sea almost up to Arctic limits, in the Baltic, and on the Atlantic coasts of the European continent: it is common in all parts of the Mediterranean, and has been found in the Black Sea and the Red Sea: it is an Indian species, though evidently a very rare one, and has been reported from the Hawaiian Islands, from the Bay of Panama, and—though there is doubt about this locality—from Australia.

Its range in fact corresponds very nearly with that of the Macruroid fish *Macrurus* (*Malacocephalus*) *lævis* Lowe, and recalls that of the Perciform fish *Lobotes surinamensis*.

In an *Account of the Investigator Deep Sea Madreporaria*, recently published by the Trustees of the Indian Museum, I have given lists of 43 species of marine animals that are common to the slopes (including both American and European sides) of the Atlantic and of the Oriental Region and Western Pacific, and in a subsequent *Account of the Investigator Deep Sea Brachyura*, also published by the Trustees of the Indian Museum, I have added several species of Crabs that are found both in American-Atlantic and in East-Indian waters: moreover, Captain A. R. S. Anderson, who is engaged in examining the Investigator Echinoids, has discovered some interesting affinities between the West-Indian, the Mediterranean, and the Oriental Echinoid fauna. So that the distribution of *Carcinus mænas* is not so singular as has been supposed.

The significance of this distribution has been discussed in the works just cited: it is emphasized by the fact that *Carcinus mænas* is a shore-crab.



## Sub-family II. PORTUNINÆ.

## BENTHOCHASCON, Alcock.

*Benthochascon Hemingi*, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan. 1899, p. 10.

*Benthochascon*, Alcock, Investigator Deep Sea Brachyura, p. 68.

Carapace sub-quadrate, nearly as broad as long, its anterior portion arched and declivous, its posterior portion flat, the regions hardly defined: no transverse ridges.

Front not very well demarcated from the inner supra-orbital angles, about a fourth the greatest breadth of the carapace in width, cut into 3 (or 4) teeth.

Antero-lateral borders much shorter than the postero-lateral, cut into four teeth including the outer orbital angle. Posterior border broadly excised.

Orbits with indistinct traces of two grooves in the upper border, the lower border concave with the inner angle dentiform and prominent. The antennules fold nearly transversely.

Basal antennal joint short, but longer than broad, freely movable; the flagellum, which is not very long, stands in the orbital hiatus.

Epistome of good length fore-and-aft, not only in the middle but at the sides, well delimited from the palate, not encroached upon by the external maxillipeds. Buccal cavern square, rather broader than long; the external maxillipeds not elongate, their merus as broad as long. The efferent branchial channels defined by ridges.

Chelipeds massive, shorter than any of the first 3 pair of legs, slightly unequal: arm short, without spines: inner angle of wrist alone spiniform: hand deep, smooth or nearly so: fingers stout, as long as or longer than hand, strongly toothed.

Legs stoutish: in the last pair the merus is elongate, the carpus is shortened and somewhat broadened, and the propodite and dactylus are typically foliaceous for swimming.

2. *Benthochascon Hemingi*, Alcock and Anderson.

*Benthochascon Hemingi*, Alcock and Anderson, Ann. Mag. Nat. Hist., January, 1899, p. 10: Alcock, Investigator Deep Sea Brachyura, p. 69, pl. iii. fig. 2.

Carapace almost as broad as long, smooth (though finely frosted) except for slight inequalities of level that scarcely define the regions, strongly declivous in its anterior third.

Front cut into three lobes of which the middle one is bifid at tip: the front is separated from the inner supra-orbital angles by a groove, not by a notch.

Antero-lateral borders considerably less than two-thirds the length of the postero-lateral, cut into four teeth (including the outer orbital angle) of which the last is spiniform and is rather remote from the others.

Posterior border peculiar in being quite flush with the surface of the carapace, and concave or broadly excised.

Orbits large, their major diameter three-fourths the width of the front, without any dorsal inclination: there are two indistinct grooves in the upper border, and the lower border is concave with the inner angle prominent and acutely dentiform. Eyes large, placed mostly on the ventral surface of the eyestalk.

Antennal flagella not much longer than the orbit.

The external maxillipeds fall considerably short of the anterior edge of the palate.

Chelipeds somewhat unequal, the larger one is between  $1\frac{1}{2}$  and  $1\frac{2}{3}$  times the length of the carapace: except for a sharp tooth at the inner angle of the wrist, and for a small sharpish tubercle at the far end of the sharply-defined inner border of the hand, they are smooth and unsculptured. The hands are full and very deep: the fingers are stout but end in acute hooked tips: in the smaller cheliped, but not in the larger cheliped, they are longer than the hand.

Legs stoutish, compressed, a notch and tooth at the far end of the anterior border of the merus of all. The 2nd pair, which are slightly longer than the 1st and 3rd, are from  $1\frac{2}{3}$  times to twice the length of the carapace: all three end in a very acute styliform dactylus. The 4th pair, which are about equal in length to the chelipeds, have the merus four times as long as broad, the carpus not particularly dilated, and the propodite and dactylus typically foliaceous and blade-like, the dactylus however ending in an acutely mucronate tip: the posterior border of the merus is unarmed.

In the Indian Museum are two specimens, both females, from the Andaman Sea 185 and 405 fms. The carapace of the larger one is 48 millim. long and 51 millim. broad.

#### PARATHRANITES, Miers.

*Lupocyclus (Parathranites) orientalis*, Miers, Challenger Brachyura, p. 186.

Carapace hexagonal, convex, moderately transverse, the regions well defined and with some definitely-placed tubercles but no transverse ridges.

The front, which projects beyond the ill-defined inner supra-orbital angles, is less than a fourth the greatest breadth of the carapace in width, and is cut into four teeth.

Antero-lateral borders oblique, not much curved, cut into five teeth including the outer orbital angles.

Orbits with two wide fissures in the upper margin, the lower margin concave with the inner angle dentiform and prominent. The antennules fold transversely.

Basal antennal joint longer than broad, slender, not nearly filling the orbital hiatus, movable; the flagellum, which stands in the orbital hiatus, long.

Epistome short fore and aft, sunk; though well enough delimited from the palate somewhat encroached upon by the external maxillipeds. Buccal cavern square, its greatest length about equals its greatest breadth: external maxillipeds rather elongate, especially the merus.

Chelipeds moderately massive, shorter than any of the first 3 pair of legs; arm wrist and hand with spines; hand prismatic, fingers stout and strongly toothed.

Legs long and slender: in the fourth pair the merus and carpus though shortened are not much broadened, and the propodite and dactylus are foliaceous and typically paddle-like.

The abdomen of the male consists of 5 segments, the 3rd-5th terga being fused.

As Miers says, this genus is allied to *Bathynectes*: in fact it is nearer to *Bathynectes* than to *Lupocyclus*.

### 3. *Parathranites orientalis*, Miers.

*Lupocyclus* (*Parathranites*) *orientalis*, Miers, Challenger Brachyura, p. 186, pl. xvii. fig. 1.

Carapace about three-fourths as long as broad (spines included), decidedly convex, the regions well demarcated, the surface granular and somewhat hairy—especially at the antero-lateral margins. There is always a tubercle in the middle line on the posterior part of the gastric region and sometimes three, in a transverse series, in front of it: there are one, or two close side-by-side, in the middle of the cardiac region, and from two to four in a fairly longitudinal series along the inner limit of either epibranchial region.

Front hardly delimited from the almost obsolete inner supra-orbital angles beyond which it projects, cut into four horizontal subacute teeth of nearly equal size.

Antero-lateral borders cut into 5 teeth, of which the first (the outer orbital angle) is remarkably prominent, the next three are very acutely anteriorly-acuminate, and the last—equally acute—stands out nearly at right angles to the others.

Posterior border nearly straight, making a dentiform angle of junction with the postero-lateral borders.

Orbits deep, without any particular dorsal inclination, their major diameter nearly equal to the width of the front; the inner angle of the lower border bilobed, the inner lobe dentiform and projecting beyond the level of the tips of the frontal teeth.

Merus of external maxillipeds produced a good deal beyond the articulation of the flagellum.

Chelipeds moderately massive, their length not  $1\frac{2}{3}$  times that of the carapace: a spinule at the far end of the anterior border of the ischium: a spine near the middle of the anterior border, and a spinule near the far end of the posterior border, of the arm: the inner angle of the wrist is produced to form a spine nearly half as long as the palm, and on the outer surface of the wrist are 3 spinules of which one is almost a spine: hand not inflated, its upper surface with 2 costæ and 3 spines of which the one at the far end of the inner border is the largest; a faint ridge along the outer surface of the hand, and one or two along the inner surface: fingers stout, nearly as long as the hand.

First 3 pair of legs long and slender, the first pair well over twice the length of the carapace. The fourth pair are very little shorter than the chelipeds and have the merus slender and quite unarmed.

2nd and 3rd abdominal terga strongly carinated in both sexes: the 6th tergum of the adult male is nearly as long as broad and has nearly parallel sides.

Colours in life salmon-pink above, tips of spines red.

In the Indian Museum are 54 specimens from off the Malabar coast 56-68 fms., off the Coromandel coast 33 fms., and from the Andamans.

The carapace of the largest specimen is 12 millim. long and 17 millim. broad.

## Sub-family II. CAPHYRINÆ.

### LISSOCARCINUS. Adams and White.

*Lissocarcinus*, Adams and White, Samarang Crust. p. 45: A. Milne Edwards, Ann. Sci. Nat. Zool., (4) XIV, 1860, p. 228, and Archiv. du Mus. X. 1861, p. 417: Miers, Challenger Brachyura, p. 204.

*Asecla*, Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 110.

Carapace either not, or very little, broader than long, smooth or with a single ridge running obliquely inwards from the last tooth of either antero-lateral border.

Front prominent beyond the inner supra-orbital angles which may be either well or rather ill defined, laminar, subentire or distinctly notched



in the middle line, its breadth (exclusive of the inner supra-orbital angles) is from half to a third the greatest width of the carapace.

Antero-lateral borders little oblique, moderately arched, cut into five lobes or teeth, including the outer orbital angle.

Basal antenna-joint short but not peculiarly broad, its outer angle is produced as a lobule that meets the front and fills the orbital hiatus so as to exclude the flagellum.

The two fissures in the upper edge of the orbit may be distinct, or may be almost indistinguishable. The antennules fold nearly transversely or a little obliquely.

Epistome short, and though well enough demarcated from the palate, somewhat overlapped by the external maxillipeds. Buccal cavern squarish, broader than long, the efferent branchial channels well defined.

Chelipeds short, but a little longer than the legs: arm short, without any distinct spines, only the inner angle of wrist dentiform; palm not prismatic, fingers stout and rather shorter than the palm.

The propodite and dactylus of the last pair of legs are typically foliaceous swimming paddles, but the carpus and merus are not particularly dilated.

The abdomen of the male consists of 5 pieces, the 3rd-5th terga being fused.

*Lissocarcinus* is distinguished from *Thalamonyx* chiefly by the sub-circular or obovate carapace and by the stumpy little sculptured chelipeds.

#### *Key to the Indian species of Lissocarcinus.*

- I. Carapace as long as broad, flat, obovate; front broadly triangular, notched at tip ... .. *L. polybioides*.
- II. Carapace broader than long, convex:—
  1. Carapace sub-rotund; front sub-entire, being dorsally grooved but not notched in the middle line, supra-orbital angles obscurely defined ... .. *L. orbicularis*.
  2. Carapace distinctly broader than long; front cut into two broad lobes exclusive of the well defined dentiform supra-orbital angles ... .. *L. lævis*.

#### 4. *Lissocarcinus polybioides*, Adams and White.

*Lissocarcinus polybioides*, Adams and White, Samarang Crust. p. 46, pl. xi. fig. 5; A. Milne Edwards, Archiv. du Mus. X. 1861, p. 417; Haswell, Cat. Austral. Crust. p. 83; Miers, Challenger Brachyura, p. 205; J. R. Henderson, Trans. Linn. Soc. Zool., (2) V. 1893, p. 378.

Carapace as long as broad, obovate with the posterior part truncated and much constricted, flat, smooth except for a low transverse ridge passing obliquely inwards from the last tooth of either antero-lateral border.

Front projecting far beyond the well pronounced inner supra-orbital angles, lamellar, horizontal, broadly triangular with the apex rather deeply notched: its breadth (not including the inner supra-orbital angles) is a little less than half the greatest breadth of the carapace.

Antero-lateral borders curved, cut into 5 anteriorly acuminate teeth (including the outer orbital angles) of which the first is the largest and the 5th the smallest.

Posterior border of dorsum of carapace forming a curve with the postero-lateral borders.

Orbits small, their major diameter less than a third the width of the inter-orbital space; two faint grooves in the upper border, the inner angle of the lower border dentiform but not prominent.

Chelipeds moderately stout, longer and stouter than the legs, a little longer than the carapace: inner angle of wrist dentiform, two or three little points—of which one is slightly larger than the others—on the outer angle: hand smooth, except for 2 crests—each of which ends in a tooth—on the upper surface, and for a small tubercle in front of the apex of the wrist-joint: fingers stout, a little shorter than the palm.

Merus of last pair of legs twice as long as broad, its posterior border, like that of the propodite, is smooth and unarmed.

6th abdominal tergum of male longer than broad, with slightly-curved gradually convergent sides.

Sternum elongate-oval particularly so in the male.

In the Indian Museum are 11 specimens, from Madras, from Orissa and Ganjam coasts 13–28 fms., from Malabar coast 28 fms., and from the Andamans.

A small species: the carapace of an egg-laden female is 7 millim. in both diameters.

##### 5. *Lissocarcinus orbicularis*, Dana.

*Lissocarcinus orbicularis*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 86, and U. S. Expl. Exp. Crust. pt. I. p. 288, pl. xviii. fig. 1a-e: A. Milne Edwards, Archiv. du Mus. X. 1861, p. 418: Richters in Mobius Meeresf. Maurit. p. 154: Miers, Zool. H. M. S. Alert, pp. 518, 541, and P. Z. S. 1884, pp. 10, 12, and Challenger Brachyura, p. 205: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 87.

*Lissocarcinus pulchellus*, Muller, Verh. Nat. Ges. Basel, VIII. pp. 475, 482, pl. v. fig. 6.

Carapace slightly broader than long, sub-circular, convex with thin edges, smooth except for a more or less distinct ridge or elevation running obliquely inwards from the last tooth of either antero-lateral border.

Front projecting a little beyond the supra-orbital angles (which are not well pronounced), arched, entire though dorsally concave in the middle line, its breadth is between a half and a third the greatest breadth of the carapace.

Antero-lateral borders curved, divided into five lobes, or, rather, broad flat puckers.

Orbits small, their major diameter is about a fourth the width of the inter-orbital space: two closed fissures near the outer end of the upper margin; inner angle of lower margin dentiform but not prominent.

Antennal flagella short.

Chelipeds a little longer than the carapace: inner angle of wrist dentiform: upper surface of hand with two carinæ, each ending in a blunt tooth, there is also a little tubercle in front of the apex of the wrist joint and an obscure ridge along the outer surface: fingers stout, a little shorter than the palm, the dactylus sharply carinate dorsally.

Legs stout, slightly shorter than the chelipeds, the merus of the last pair is about twice as long as broad and its posterior border, like that of the propodite, is smooth.

Colours very characteristic: carapace dark maroon (chocolate in spirit) with symmetrical yellow markings, chelipeds and legs cross-banded yellow and maroon.

In the Indian Museum is a single egg-laden female from Kiltán I. (Laccadives): its carapace is 10 millim. long and 11.5 millim. broad.

#### 6. *Lissocarcinus lævis*, Miers.

*Lissocarcinus lævis*, Miers, Challenger Brachyura, p. 205, pl. xvii, fig 3: J. R. Henderson, Trans. Linn. Soc. Zool., (2) V. 1893, p. 378.

Carapace distinctly broader than long, convex, perfectly smooth.

Front a little prominent beyond the well pronounced supra-orbital angles, divided into two broad lobes, its breadth (not including the supra-orbital angles) is barely a third the greatest breadth of the carapace.

Antero-lateral borders curved, cut into 5 blunt lobes, of which the first and last are the smallest.

Orbits large, their major diameter nearly half the width of the inter-orbital space, their upper border entire, though traces of the two sutures may be visible.

Chelipeds rather longer than the carapace; a small lobule at the far end of the anterior border of the arm, inner angle of wrist stoutly spiniform, hand smooth except for a tiny tubercle in front of the apex of the wrist joint.

First 3 pairs of legs slender: merus of last pair less than twice as long as broad, its posterior border ending in an almost dentiform carina.

6th abdominal tergum of male broader than long, broadest in the middle, its sides therefore curved.

In spirit the carapace is white with some purplish-brown markings.

In the Indian Museum are 9 specimens, from off Ceylon  $26\frac{1}{2}$  fms., off the Malabar coast 26–31 fms., off Mergui 40 fms. and from the Andamans.

The largest specimen has a carapace 9.5 millim. long and 11 millim. broad.

### Sub-family III. LUPINÆ.

#### Alliance I. *Lupocycloida*.

#### LUPOCYCLUS, Adams and White.

*Lupocyclus*, Adams and White, Samarang Crust. pp. 46, 47: A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XIV. 1860, p. 228, and Archiv. du Mus. X. 1861, p. 337: Miers, Challenger Brachyura, p. 185 (not subgenus *Parathranites*).

Carapace little broader than long, or even sub-circular, convex, the regions faintly indicated, with granular transverse ridges of definite position.

Front proper (not including the rather obscurely defined reduplicated inner supra-orbital angles) prominent and cut into 4 teeth.

Antero-lateral borders moderately oblique and moderately curved, about equal in length to the postero-lateral, cut into 5 or 6 teeth (including the outer orbital angle) with little denticles in some or all of the interdental spaces, bringing the total number to 9. (The denticles are sometimes so small as to escape notice).

Orbits large with a considerable dorsal inclination: the upper border with 2 fissures: the inner angle of the lower border though dentiform does not project anywhere near the level of the tips of the middle frontal teeth. The antennules fold transversely.

Basal antenna-joint about as long as broad, filling the orbital hiatus; not quite firmly fixed; flagellum long, standing in the orbital hiatus.

Epistome short, somewhat sunken. Buccal cavern somewhat broader than long: efferent branchial channels well defined.



Chelipeds very long, much longer than any of the legs, rather slender; the hand slenderer than the arm: the arm with spines, both inner and outer angles of wrist spiniform, the hand with spines and costæ, the fingers long and slender.

Legs slender: propodite and dactylus of last pair typically foliaceous and blade-like for swimming.

Abdomen of male five-jointed the 3rd-5th terga being fused: the first tergum almost concealed beneath the carapace.

*Key to the Indian species of Lupocyclus.*

- I. Frontal teeth blunt-pointed; chelipeds less than three times the length of the carapace, the arm being stout and prismatic: merus of last pair of legs broadened and compressed ... .. *L. rotundatus.*
- II. Frontal teeth acutely pointed: chelipeds more than three times the length of the carapace, the arm being slender and cylindrical: merus of last pair of legs slender ... .. *L. strigosus.*

7. *Lupocyclus rotundatus*, Adams and White.

*Lupocyclus rotundatus*, Adams and White, Samarang Crust. p. 47, pl. xii. fig. 4: A. Milne Edwards, Archiv. du Mus. X. 1861, p. 387: de Man, Notes Leyden Mus. V. 1883. p. 153: Miers, Zool. H. M. S. Alert, pp. 184, 234, and Challenger Brachyura, p. 186. See also de Man, Zool. Jahrb., Syst. etc., II. 1886-87, p. 718.

? *Goniosoma inæquale*, Walker, Journ. Linn. Soc., Zool., XX. 1886-90 (1887) p. 116, pl. viii. fig. 4.

? *Lupocyclus inæqualis*, Henderson, Trans. Linn. Soc. Zool. (2) V. 1893, p. 378.

Carapace sub-circular in the young but becoming as much as five-sixths as long as broad in large individuals, convex, subtomentose, its surface broken by transverse granular ridges which are similar in number and position to those of *Neptunus (Lupocycloporus) whitei* A. M. Edw. but are more elevated and discontinuous and therefore look more like series of tubercles.

Front prominent beyond the dorsally-grooved, or reduplicated, inner supra-orbital angles, cut into four teeth of not very unequal size, of which the middle two are the most prominent and the most acute. Supra-orbital margin with two sutures or not very open fissures.

Antero-lateral borders cut into five rather coarse teeth (including the outer orbital angle), and in every one of the interdental spaces there is a denticle: these intervening denticles are so small in young individuals that some of them may escape notice, but in large individuals they are all very distinct. Posterior border straight, but forming a curve with the postero-lateral borders.

Antennal flagella more than half as long as the carapace.

Chelipeds rather more than  $2\frac{1}{2}$  times the length of the carapace in the male, and having the same form and proportions as those of *Neptunus* (*Lupocycloporus*) *whitei*, the arm being much stouter than the hand and the surface of most of the segments being granular with a squamiform sculpture: 5 spines on the anterior border of the arm and 2 in the distal third of the posterior border: hand and wrist slender, costate—the costæ granular: a spine at the inner and the outer angles of the wrist: hand with 3 spines, one being in front of the apex of the wrist-joint, the other two being side by side some little distance behind the finger-joint. The fingers are stoutish, as long as the hand, and are gently incurved, but have the extreme tips sometimes slightly bent outwards: their opposed edges have jagged teeth like those of any *Neptunus*.

The first three pair of legs are slender. The fourth pair have all their joints broadened as in any *Neptunus*, though the merus and carpus are not quite so broad, relatively, as in that genus; there is a spine near the far end of the posterior border of the merus of this pair.

The 2nd and 3rd abdominal terga are sharply and decidedly carinate.

In the Indian Museum are 14 specimens representing both sexes and several ages, from the Andaman Sea up to 55 fms. and from off Ceylon  $26\frac{1}{2}$ –32 and 34 fms. The largest male has the carapace 15 millim. long and 19 millim. broad, but there are two egg-laden females only about half this size.

The four smallest specimens are identical with White's figure of *Lupocyclus rotundatus*, the two largest specimens agree with Walker's description and figure of *Goniosoma inæquale*, the six middle-sized specimens cannot be decisively separated from either: I therefore think that all belong to one species.

#### 8. *Lupocyclus strigosus*, n. sp.

(an *Lupocyclus philippinensis*, Semper, Nauck ?)

Except in the form of the chelipeds (which are even slenderer than those of *Lupa forceps*) and last pair of legs, this species is very much like *L. rotundatus*, from which it differs in the following characters:—

(1) the carapace is perhaps a little more nearly circular, and is distinctly more convex:

(2) the front is more prominent, is practically confluent with the inner supra-orbital angles, and is cut into four sharp teeth, of which the middle two are much smaller than the others:

(3) the antero-lateral borders are armed with five slender spiniform teeth *not* including the outer orbital angle, and the denticles of the interspaces are represented by granules or are quite inconspicuous :

(4) the chelipeds in the male are  $3\frac{3}{4}$  times the length of the carapace and are very slender, especially in the palm : there are 6 or 7 spines along the anterior border of the arm, which is a slender cylindrical joint, and two much smaller ones in the distal fourth of the posterior border : the fingers are considerably longer than the palm, are extremely slender, and their opposed edges are armed with close-set fine regular teeth having larger acicular teeth at fairly regular intervals—much as in the Leucosine genus *Arcania* :

(5) the last pair of legs, though otherwise similar to those of *L. rotundatus*, have the basal joints, up to and including the carpus, slender, sub-cylindrical, and, in fact, hardly stouter than the corresponding joint of the other legs.

In other respects this species agrees with *L. rotundatus*.

In the Indian Museum are five specimens—from the Andaman Sea 15 fms., from off the Madras coast, 33 fms., and from off the Konkan coast, 56–58 fms.

In the type specimen the carapace is 8 millim. long and 9 millim. broad.

#### CARUPA, Dana.

*Carupa*, Dana, Silliman's Amer. Journ. Sci. and Arts (2) XII. 1850, p. 129 ; Proc. Ac. Nat. Sci. Philad. 1852, p. 85 ; and U. S. Expl. Exp. Crust. pt. I. p. 279 ; A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XIV. 1860, p. 228, and Archiv. du Mus. X. 1861, p. 386.

Carapace transverse, broad, moderately convex, with smooth unbroken surface.

The front proper projects slightly beyond the rather ill-defined inner supra-orbital angles, and is either broadly bilobed or cut into four shallow lobes : its breadth is about a fourth the greatest breadth of the carapace.

Antero-lateral borders moderately oblique and arched, about the same length as the postero-lateral, cut into 7 rather irregular lobes (including the outer orbital angles).

The orbit, which has little or no dorsal inclination, has two notches in its upper border ; the lower border crenulate. The antennules fold almost transversely.

Basal antenna-joint as long as broad, rather slender ; the flagellum, which is of moderate length, stands in the orbital hiatus.

Epistome sufficiently long. Buccal cavern squarish, broader than long, the efferent branchial channels very well defined.

Chelipeds longer and vastly more massive than the legs: arm with spines, one or both angles of wrist spiniform; palm inflated, massive, nearly smooth: fingers stout, hardly as long as palm, strongly toothed.

Legs slender: in the fourth pair the merus is elongate and the carpus slender, but the propodite and dactylus are typical swimming paddles.

First abdominal tergum narrow, almost hidden by the carapace: in the male the 2nd–5th terga are fused—though the suture between the 2nd and 3rd may be visible—so that the abdomen consists of 4 pieces only.

#### 9. *Carupa læviuscula*, Heller.

*Carupa læviuscula*, Heller, Verh. zool. bot. Ges. Wien, XII. 1862, p. 520, and Novara Crust., p. 27, pl. iii. fig. 2: de Man, Notes Leyden Mus. V. 1883, p. 152, and Archiv. f. Naturges. LIII. 1887, i. p. 336: Ortmann, Zool. Jahrb., Syst. VII. 1893-94, p. 68 and in Semon's Forschungsr. Crust. (Jena. Denk. VIII) p. 44: Zehntner, Rev. Suisse Zool. II. 1894, p. 161.

Carapace about  $\frac{2}{3}$  as long as broad, perfectly smooth to the naked eye, frosted with minute granules under the lens.

Front cut into 4 shallow lobes, of which the middle two are the narrowest. Supra-orbital margin with two notches, infra-orbital margin cut into four lobes of which the middle two are the narrowest.

Antero-lateral borders cut into 7 teeth (including the outer orbital angle), of which the 5th is the smallest and the 6th the largest and most acute. The postero-lateral angles of the carapace are well defined.

Antennal flagella more than half the length of the carapace.

Chelipeds about  $2\frac{1}{4}$  times the length of the carapace, in the male: arm short with 3 claw-like spines on the anterior border, the posterior border being smooth: inner angle of wrist strongly spiniform, the outer angle rounded, but armed with a spinule below: hand smooth, its upper border well defined.

In young specimens, as in the young of *Scylla serrata*, there may be two faint costae or two lines of small granules along the upper surface of the hand, and also there may be some costiform lines of small granules on the upper surface of the wrist.

The legs are slender and smooth: the last pair have only the last two joints dilated for swimming.

In the Indian Museum are two specimens (one badly damaged) from the Andamans and one from the Madras coast—besides one from Samoa and one from Mauritius.



Alliance II. *Lupoida.*

## SCYLLA, De Haan.

*Scylla*, De Haan, Faun. Japon. Crust. p. 11: A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XIV. 1860, pp. 228, 249, and Archiv. du Mus. X. 1861, p. 347: Miers, Challenger Brachyura, p. 184.

Carapace transverse, broad, moderately convex, with an almost unbroken surface.

Front proper well delimited from the inner supra-orbital angles, cut into four teeth: its breadth (not including the supra-orbital angles) is between a fourth and a fifth the greatest breadth of the carapace.

Antero-lateral borders oblique, arched, longer than the postero-lateral, cut into 9 teeth of nearly equal size.

Orbit without any dorsal inclination: two nearly closed fissures in its upper wall: the inner angle of the lower border dentiform and prominent. The antennules fold nearly transversely.

Basal antenna-joint short and broad, its antero-external angle produced to form a lobule lying in the orbit: the flagellum, which is of good length, stands in the orbital hiatus.

Epistome sufficiently long fore and aft, not sunken. Buccal cavern squarish, broader than long: the efferent branchial channels cavernous, but not defined by ridges.

Chelipeds massive, longer than any of the legs: arm wrist and hand with definitely placed spines: hand deep and full, not prismatic, not costate.

Legs stout, moderately compressed: in the fourth pair the merus and carpus are shortened and broadened, and the propodite and dactylus are typically foliaceous for swimming.

Abdomen of male rather broadly triangular, consisting of 5 segments, the 3rd-5th terga being fused. The first tergum is much concealed beneath the carapace.

10. *Scylla serrata* (Forsk.) De Haan.

*Cancer serratus*, Forskal, Descr. Anim. p. 90.

*Cancer olivaceus*, Herbst, Krabben, II. V. 157, pl. xxxviii. fig. 3.

*Portunus tranquebaricus*, Fabricius, Ent. Syst. Suppl. p. 366; Bosc, Hist. Nat. Crust. I. p. 219; Latreille, Hist. Nat. Crust. VI. p. 16 and Encycl. Meth. X. p. 191.

*Portunus serratus*, Rüppell, 24 Krabben roth. Meer. p. 10, pl. ii.

*Lupea tranquebarica*, Milne Edwards, Hist. Nat. Crust. I. 448.

*Lupea lobifrons*, Milne Edwards, Hist. Nat. Crust. I. 453 (*vide* A. M. Edw.).

*Scylla serrata* De Haan, Faun. Japon. Crust. p. 44: Krauss, Sudafr. Crust. p. 25: A. Milne Edwards, Ann. Sci. Nat. Zool. (4) XIV. 1860, p. 252, and Archiv. du Mus. X. 1861, p. 349, and Nouv. Archiv. du Mus. IX. 1873, p. 162, and in Maillard's

Pile Réunion, Annexe F p. 2: Hess Archiv. f. Naturges. XXXI. 1865, i. pp. 139, 172: Heller, Novara Crust. p. 27: Miers, Crust. New Zealand, p. 27: Hilgendorf, MB. AK. Berl. 1878, p. 799: E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 59, pl. i. figs. 22, 24 (*gastric teeth*): Haswell, Cat. Austral. Crust. p. 79: Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 238; and Zool. H. M. S. Alert, pp. 518, 538; and Challenger Brachyura, p. 185: Fühler, Crust. N. Zel., Miss. ile Campbell, p. 382: de Man, Archiv. Naturges. LI. 1887, i. p. 332; and in Weber's Zool. Ergebn. Niederl. Ost. Ind. II. 1892, p. 285: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 215: Ortmann, Zool. Jahrb. Syst. VII. 1893, p. 78, and in Semon's Forschungs. (Jena-Denk. VIII.) Crust. p. 45: Henderson, Trans. Linn. Soc. Zool., (2) V. 1893, p. 372.

*Scylla tranquebarica*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 270: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 38.

? *Achelous crassimanus*, Macleay Ill. Annulosa. S. Afr. p. 61, (sec. A. M. E.).

Carapace about  $\frac{2}{3}$ , or a little less, as long as broad, practically smooth, except for a faint granular ridge running obliquely inwards across either branchial region from the last spine of the antero-lateral border.

Front cut into four lobes or bluntish teeth of about equal size and prominence. Antero-lateral borders cut into 9 sharply acuminate teeth of about equal size: posterior border forming a curve with the postero-lateral borders, the points of junction sometimes slightly thickened.

Merus of external maxillipeds oblique but not having the antero-external angle distinctly produced in a lateral direction.

Chelipeds not quite twice the length of the carapace in the adult male, but shorter than this in the female and young male. Arm with 3 spines on the anterior border, and 2 on the posterior border—one terminal, the other submedian: a strong spine at inner angle of wrist, the outer angle being rounded and armed with one, or sometimes two, small spines or teeth: hand with 3 spines or tubercles, one being in front of the apex of the wrist-joint, the other two being side by side behind the finger-joint—(the outer of these two is sometimes obsolescent).

Legs unarmed.

Abdomen of male broadly triangular.

An extremely common crab in all the estuaries and backwaters of India, from Karáchi to Mergui. It grows to a large size.

In young specimens the frontal lobes are broad and indistinct, the upper surface of the palm is traversed by two faint but distinct longitudinal costæ, and there may be a transverse granular line across the gastric region.

This is the common edible crab of India,

NEPTUNUS, De Haan, A. Milne Edwards, Miers.

*Neptunus*, De Haan, A. Milne Edwards, Ann. Sci. Nat., (4) XIV. 1860, p. 226 and Archiv. du Mus. X. 1861, p. 314 (*ubi syn.*)

*Neptunus*, *Achelous*, *Amphitrite*, *Pontus*, De Haan, Faun. Japon. Crust. pp. 7, 8, 9.

*Posidon*, Herklots, Add. Faun. Carcin. Afric. Occ. p. 3.

*Lupa*, *Arenaeus*, *Amphitrite*, Dana, U. S. Expl. Exp. Crust. pt. I. pp. 270, 275, 289.

*Euctenota*, Gerstaecker, Archiv. f. Naturges. XXII. 1856, i. p. 131.

*Neptunus*, *Achelous*, A. Milne Edwards *op. cit.*

*Callinectes*, Stimpson, Ann. Lyc. Nat. Hist. New York, VII. 1860, p. 220.

*Xiphonectes*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 157.

*Hellenus*, A. Milne Edwards, Miss. Sci. Mex., Crust. pp. 210, 221.

*Neptunus*, *Xiphonectes*, Miers, Challenger Brachyura, pp. 171, 183.

*Portunus*, M. J. Rathbun, see Proc. Biol. Soc. Washington, June, 1897, pp. 155, 160.

Carapace usually transverse, broad, and depressed or little convex, often with the surface areolated.

Front proper well delimited from the inner supra-orbital angles and cut into from 3 to 6—usually *four*—teeth: its breadth (not including the supra-orbital angles) is from a sixth to a fifth the greatest breadth of the carapace (lateral epibranchial spines not included), and it is often somewhat receding.

Antero-lateral borders oblique, arched, longer than the postero-lateral, cut into 9 regular teeth (including the outer orbital angle) of which the 9th may be enlarged or not.

The orbit usually has 2 fissures or sutures in the upper border, which border is less prominent than the lower border, so that the orbit very often has a dorsal inclination: the lower border has a fissure or suture near the outer angle, and the inner angle is dentiform and usually very prominent. The antennules fold transversely.

The basal antenna-joint is peculiarly short and has its antero-external angle produced to form a lobule or spine extending into the orbit: the flagellum, which is of fair length, stands in the orbital hiatus.

Epistome short or even linear, sometimes prolonged in the middle line to form a spine lying below the inter-antennular septum. Buccal cavern squarish, broader than long, the efferent branchial channels almost always very well defined.

Chelipeds longer, usually much longer, than any of the legs, and massive: arm with spines, both inner and outer angles of wrist spiniform, palm prismatic costate and usually with spines, fingers usually nearly as long as the palm and strongly toothed.

Legs compressed: in the last pair the merus and carpus are short and broad, and the propodite and dactylus are typically foliaceous and paddle-like for swimming.

The abdomen of the male is five-jointed, the 3rd-5th terga being fused: the 1st tergum in both sexes is almost entirely concealed beneath the carapace.

The Indian species of the genus *Neptunus* fall into five groups, or subgenera, which are characterized as follows :—

- I. Carapace very broad, little convex, and having the junction of the posterior with the postero-lateral angles rounded. Front not projecting beyond, or even receding behind, the internal supra-orbital angles: the last spine of the antero-lateral borders enormously larger than any of the others. Orbits of moderate size and having only a slight dorsal inclination. Antero-external angle of basal antenna-joint produced to a spiniform process lying in the orbit. Epistome produced in the middle line to form a very prominent spine: the antero-external angle of the merus of the external maxillipeds rounded, not produced laterally. Hand at least as massive as the arm..... NEPTUNUS.
- II. Carapace moderately broad, little convex, and having the postero-lateral junctions rounded. Front hardly projecting beyond the internal supra-orbital angles, but not receding: the last spine of the antero-lateral borders a good deal the largest. Orbits large, with a very strong dorsal inclination. Antero-external angle of basal antenna-joint forming a blunt lobe-like process. Epistome slightly produced in a spiniform manner: the antero-external angle of the merus of the external maxillipeds strongly produced in a lateral direction. Hand at least as massive as arm ..... AMPHITRITE.
- III. Carapace suborbicular or not very broad, flat, the postero-lateral junctions rounded. Front slightly projecting beyond the internal supra-orbital angles: the last spine of the antero-lateral border either hardly larger or actually smaller than any of the others. Orbits of moderate size and with a moderate dorsal inclination. Antero-external angle of basal antenna-joint forming a lobe-like process. Epistome hardly produced in the middle line: antero-external angle of merus of external maxillipeds strongly produced in a lateral direction. Hand hardly less massive than the arm ..... ACHELOUS.
- IV. Carapace moderately broad, flat or little convex, and having the postero-lateral junctions angular or actually spiniform. Front decidedly prominent beyond the inner supra-orbital angles: the last spine of the antero-lateral borders very much the largest. No free prolongation of the epistome in the middle line. Hand about as massive as arm. [Except in *N. spinipes*, the angle of the basal antenna-joint is a lobe-like process. Except in *N. tuberculosus* and *brockii*, the orbits are large with a very strong dorsal inclination. Except in *N. hastatoides*, the antero-external angle of the



- merus of the external maxillipeds is not produced in a lateral direction] ..... HELLENUS.
- V. Carapace moderately broad, distinctly convex, rounded postero-laterally. Front projecting beyond the inner supra-orbital angles: the last spine of the antero-lateral borders slightly the largest. Orbits large, with strong dorsal inclination. Basal antenna-joint longitudinally grooved on ventral surface. No free prolongation of the epistome in the middle line: no lateral expansion of the antero-external angle of the merus of the external maxillipeds. Hand much slenderer than the arm ..... LUPOCYCLOPORUS.

*Key to the Indian species of the genus Neptunus.*

- I. Hand either more, or but little less, massive than arm:—
- A. Last spine of antero-lateral border much the largest:—
1. Posterior angles of carapace rounded (NEPTUNUS):—
- i. Antero-external angle of merus of external maxillipeds rounded:—
- a. No spine on the posterior border of the arm ..... *N. sanguinolentus.*
- b. A spine at far end of posterior border of arm ..... *N. pelagicus.*
- ii. Antero-external angle of merus of external maxillipeds strongly produced in a lateral direction (AMPHITRITE):—
- a. No spot on dactylus of last pair of legs ..... *N. gladiator.*
- b. A spot on dactylus of last pair of legs: crests of hands and abdomen with a pearly sheen ..... *N. argentatus.*
- c. Spine at inner angle of wrist two-thirds as long as palm ..... *N. petreus.*
2. Posterior angles of carapace square or spiniform (HELLENUS):—
- i. Posterior angles square: front cut into 3 teeth ..... *N. tenuipes.*
- ii. Posterior angle spiniform: front cut into 4 teeth:—
- a. Two distinct spines on posterior border of arm:—
- π. After half of distal border of merus of last pair of legs finely serrulate ..... *N. hastatoides.*
- β. After half of distal border of merus of last pair of legs smooth ..... *N. andersoni.*

*Neptunus sanguinolentus*, De Haan, Faun. Japon. Crust. p. 38: A. Milne Edwards, Archiv. du Mus. X. 1858-1861, pp. 319, 339, and in Maillard's Île Réunion,

Annexe F. p. 2: Heller, "Novara" Crust. p. 26: Brocchi, Ann. Sci. Nat. (6) II. 1875. Art 2, p. 55, pl. xvi. figs. 83, 84 (*male appendages*): Miers, Cat. New Zealand Crust. p. 26, and Ann. Mag. Nat. Hist. (5) V. 1880, p. 238, and Challenger Brachyura, p. 174: Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 106: Haswell, Cat. Austral. Crust., p. 77: Filhol, Crust. Nouv. Zél., Miss de l'île Campbell, p. 382, F. Muller, Verh. Naturf. Ges. Basel, VIII. 1886, p. 475: de Man, Archiv. f. Naturges. LIII. i. 1887, p. 328, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 285 and Zool. Jahrb., Syst. etc., VIII. 1894-95, p. 556: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 212: Pfeffer, Mitt. Nathist Mus. Hamburg VII. 1889 (1890), No. 8, p. 6 (*female dimorphism*): J. R. Henderson, Tr. Linn. Soc. Zool. (2) V. 1893, p. 368: Ortmann, Zool. Jahrb., Syst. etc., VII. 1893, p. 75, and in Semon's Forschungsgr. (Jena, Denk VIII) Crust. p. 45.

Carapace very broad, little convex, its length in the middle line half its breadth excluding the great lateral spines, finely granular everywhere in the young but only in the anterior half in the adult, crossed transversely by some slightly-raised granular lines—two on the gastric, one on either branchial region—conspicuously marked posteriorly by three large blood-red spots.

Front cut into four sharp and very distinct teeth—not counting the inner supra-orbital angles—of which the middle two are the less prominent and have projecting between and far beyond them the spine-like process of the epistome. Supra-orbital borders cut by 2 fissures into 3 lobes, the angles of the middle lobe not conspicuous.

Antero-lateral borders very long and oblique, cut into 9 teeth including the outer orbital angle) the last of which is about four times as long as any of the others. The posterior border, which is smooth, forms a common curve with the postero-lateral borders.

Antero-external angle of merus of external maxillipeds not produced.

Chelipeds in the adult male about  $2\frac{2}{3}$  times the length of the carapace, but rather less in the female and young male: the hand is the most massive segment. Arm with 3 or 4 large spines on the anterior (inner) border, but without any on the posterior border. Hand and outer surface of wrist costate, the costæ smooth: both inner and outer angle of wrist strongly spiniform: the palm, which is not, or only slightly, longer than the fingers has two spines dorsally, one being in front of the apex of the wrist-joint, the other just behind the finger-joint.

Legs smooth: a spinule near the far end of the posterior border of the carpus of the first two pairs.

A large species.

In the Indian Museum are 60 specimens, from Penang, Nicobars, east and west coasts of the Peninsula, Ceylon, and Karáchi.

12. *Neptunus pelagicus*, Linn.

*Pagurus reidjungan*, Rumph, Amboinsch. Rariteitk. I. p. 11 (which also seems to include *N. sanguinolentus*), pl. vii. fig. R.

*Cancer pelagicus*, Linnæus, Mus. Lud. Ulr. p. 434, and Syst. Nat. (xii. ed.) p. 1042: Forskal, Descr. Anim. p. 89: Fabricius, Ent. Syst. II. p. 447 (part).

*Cancer cedo-nulli*, Herbst, Krabben, II. ii. 157, pl. xxxix.

*Cancer reticulatus*, Herbst, Krabben, III. i. 65, pl. l.

*Portunus pelagicus*, Fabricius, Ent. Syst. Suppl. p. 367: Latreille, Hist. Nat. Crust. VI. 16, and Encycl. Meth. X. p. 188: Savigny, Descr. Egypt. pl. iii. fig. 3 (Audouin, Expl. p. 83).

*Portunus cedo-nulli*, Bosc, Hist. Nat. Crust. I. p. 221.

*Lupa pelagica*, Desmarest, Dict. Sci. Nat. XXVIII. p. 223 and Consid. Gen. Crust. p. 98, pl. vi. fig. 2: Milne Edwards, Hist. Nat. Crust. I. 450: Lucas, Hist. Nat. Anim. Art. Crust. p. 101, pl. vii. fig. 2: Dana, U. S. Expl. Exp. Crust. pt. I. p. 271: Stimpson, Proc. Acad. Nat. Sci. Philad. 1858, p. 38: Heller, SB. AK. Wien, XLIII. 1861, p. 355: Hilgendorf in v. d. Decken's Reisen Ost-Afr. III. i. p. 77: Tozzetti, 'Magenta' Crust. p. 66, pl. v. fig. 3a-b.

*Neptunus pelagicus*, DeHaan, Faun. Jap. Crust. p. 37, pl. ix, x: Krauss, Sudafr. Crust. p. 23: A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 320, 329, and Nouv. Archiv. du Mus. IV. 1868, p. 70, and IX. 1873, p. 156: Heller, Novara Crust. p. 27: Hess, Archiv. f. Naturges. XXXI. 1865, i. pp. 138, 172: Brocchi, Ann. Sci. Nat. (6) II. 1875, Art. 2, p. 52, pl. xv. fig. 74, 75 (male appendages): Miers, Cat. New Zealand Crust. p. 25, and Ann. Mag. Nat. Hist. (4) XVII. 1876, p. 221, and (5) V. 1880, p. 238, and Zool. H.M.S. Alert, pp. 183, 289, and Challenger Brachyura, p. 173: Kossmann, Reise roth Meer. Crust. p. 46: Neumann, Cat. Crust. Heidelb. Mus. p. 24: Hilgendorf, MB. AK. Berl. p. 799: Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 62 (gastric teeth): de Man, Notes Leyden Mus. II. 1880, p. 183, and Archiv. f. Naturges. LIII. 1887, i. p. 328, and Journ. Linn. Soc., Zool., XXII. 1888, p. 69, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 284: Haswell, Cat. Austral. Crust. p. 77: Filhol, Crust. Nouv. Zél. p. 381: Cano, Boll. Soc. Nat. Napoli, III. 1889, p. 212: Pfeffer, Mitteil. Nat. Hist. Mus. Hamb. XII. 1889, No. 8, p. 6: A. O. Walker, Journ. Linn. Soc., Zool., XX. 1890, p. 110: J. R. Henderson, Trans. Linn. Soc. Zool., (2) V. 1893, p. 367: Ortmann, Zool. Jahrb., Syst., VII. 1893, p. 74, and in Semon's Forschungsgr. (Jena. Denk. VIII.) Crust. p. 45.

? *Neptunus armatus*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 322, 339, pl. xxxiii. fig. 2: Miers, Zool. H. M. S. Alert, pp. 183, 229: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 212: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 370: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 75.

*Neptunus trituberculatus*, Miers, Ann. Mag. Nat. Hist., (4) XVII. 1876, p. 221 and (5) V. 1880, p. 238, and Cat. Crust. New Zealand, 1876, p. 25, and Challenger Brachyura, p. 172: Ortmann, Zool. Jahrb. Syst. VII. 1893, p. 74.

Carapace broad, little convex, its length a little more than half its breadth without the great lateral spines, at all ages closely covered with largish miliary granules: two transverse lines on the gastric, one on either branchial region: sometimes two lumps on the cardiac and one on the post-gastric region, these being very variable in size and distinctness.



Front cut into four teeth—not counting the inner angles of the orbit—of which the middle two are small and little prominent, or obsolescent, or even confluent and obsolete: between and far beyond them projects the spine-like process of the epistome. Supra-orbital borders cut by two fissures into three lobes, the outer angle of the middle lobe being usually dentiform.

Antero-lateral and posterior borders and external maxillipeds almost as in the preceding species.

Chelipeds in the adult male more than 3 times, in the female and young male not quite  $2\frac{1}{2}$  times the length of the carapace—the hand the most massive segment. Arm with 3 large spines on the anterior (inner) border and with 1 at the far end of the posterior border. Wrist and hand much as in the preceding species, but the costæ are, for the most part, granular, and the hand carries 3 spines two of which stand side by side behind the finger-joint.

Legs as in *N. sanguinolentus*.

Colours in spirit yellowish, the carapace chelipeds and proximal joints of the last pair of legs having the dorsal surface copiously and coarsely reticulated with bluish and purplish green.

A large species.

In the Indian Museum are 46 specimens from all parts of the coasts of the Indian Seas, from Penang to the Persian Gulf, besides 13 from Japan, Hongkong, Australia and Suez.

### 13. *Neptunus (Amphitrite) gladiator* (Fabr.).

*Portunus gladiator*, Fabricius, Ent. Syst. Suppl. p. 368: Bosc, Hist. Nat. Crust. I. p. 219: Latreille, Hist. Nat. Crust. VI. p. 19, and Encycl. Meth. X. p. 189.

*Cancer menestho*, Herbst, Krabben, III. iii. 34, pl. lv. fig. 3.

*Lupea gladiator*, Milne Edwards, Hist. Nat. Crust. I. 456.

*Amphitrite gladiator*, De Haan, Faun. Jap. Crust. p. 39, pl. i. fig. 5: Haswell, Cat. Austral. Crust. p. 84.

*Neptunus gladiator*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 330, 339: Richters in Möbius Meeresf. Maurit. p. 152: Muller Verh. Nat. Ges. Basel, VIII. 1886, p. 475: Miers, Challenger Brachyura, p. 177: de Man, Journ. Linn. Soc., Zool., XXII. 1888, p. 69: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 367: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 73.

*Amphitrite Haanii*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 38.

? *Amphitrite media*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 39 (v. A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 331, 339 and Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 73).

Carapace depressed, finely subtomentose, its length about two-thirds its breadth without the great lateral spines, its surface broken by low symmetrically disposed sub-regional elevations the summits aloze of which are granular.

Front cut into four acute teeth (not counting the inner supra-orbital angles) of which the middle two are the smaller and less prominent and have projecting between them the dentiform process of the epistome. Supra-orbital margin cut by two fissures into three lobes, the outer angle of the middle lobe strongly dentiform.

Antero-lateral and posterior borders much as in the preceding species except that the great lateral spines are only about  $2\frac{1}{2}$  times the length of any of the others.

Eyes large, reniform, not concealed to dorsal view by the orbits, which are large and almost entirely dorsal in position.

Antero-external angle of merus of external maxillipeds very strongly produced in a lateral direction.

Chelipeds in the adult male a little over  $2\frac{1}{2}$  times the length of the carapace, somewhat shorter in the female—the hand the most massive segment: granular in places, the granules on the upper surface of the arm and under surface of the hand forming sub-squamiform lines. Arm with 4 spines on the anterior (inner) border and 2 near the far end of the posterior border. Wrist and hand costate, the costæ granular. Both inner and outer angle of wrist strongly spiniform, the former very strongly so. Two spines on the hand, one being just in front of the apex of the wrist-joint, the other being a short distance behind the finger-joint: the carina that forms the outer boundary of the lower surface of the hand is very salient.

Legs, like the arm, tomentose in places, but very strongly so along the anterior (inner) border: no spinule on the posterior border of the carpopodites.

The abdomen in the male has remarkably sinuous lateral borders: the 2nd and 3rd abdominal terga in both sexes are very strongly carinated.

Colours in spirit yellow, often with some red markings on edges of carapace and on fingers and on spines of chelipeds.

A species of medium size, adult males having the carapace about 33 millim. long and about 65 millim. broad including the great lateral spines.

In the Indian Museum are 13 specimens from Ceylon, Madras, Sunderbunds, and Mergui.

#### 14. *Neptunus (Amphitrite) argentatus* (White) A. M. Edw.

[“*Amphitrite argentata*, White List. Crust. Brit. Mus. p. 126.”]

*Neptunus argentatus*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 332, 339, pl. xxxi. fig. 4: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 368.

*Neptunus gladiator*, var. *argentatus*, Miers, Challenger Brachyura, p. 177: Cano, Boll. Soc. Nat. Napoli. III. 1889, p. 214: Ortmann, Zool. Jahrb. Syst., VII. 1893-94, p. 73.

Very like *N. gladiator* but easily distinguished by the following characters:—

(1) the carapace is longer and narrower, its length being three-fourths its breadth without the great lateral spines; and its sub-regional convexities are in much stronger relief and much better defined:

(2) the median frontal teeth are smaller and less prominent, and the outer angle of the middle lobe of the supra-orbital margin is less acute:

(3) the crests of the outer surface of the palm and immobile finger and of the third abdominal segment are not only more salient and trenchant, but also have a curious silvery or coppery pearly sheen:

(4) the chelipeds are shorter; and there is a dark round spot near the tip of the dactylus of the last pair of legs.

It is a very much smaller species; only one of numerous egg-laden females in the Indian Museum has the carapace more than 20 millim. long and 30 millim. broad (including spines). Specimens of *N. gladiator* of this size are obviously immature.

In the Indian Museum are 63 specimens from the Andamans, Mergui (Marine Survey), Arakan coast, Ganjam coast, Ceylon, and Malabar coast. Nearly half the specimens are recorded from depths of 18 to 33 fathoms.

15. *Neptunus (Amphitrite) argentatus* var. *glareosus*.

In this variety the carapace is even narrower and more elongate, its subregional convexities are hardly less salient and well defined than those of *N. tuberculosus*, and its surface is almost free of tomentum. The carina of the 3rd abdominal tergum is about twice as prominent as it is in the typical form, having the shape of a prominent foliaceous lobe. The dorsal surface of the body and chelipeds is profusely speckled.

26 specimens, including egg-laden females, were dredged from a bottom of sand and stones off the Andamans at 55 fathoms.

16. *Neptunus (Amphitrite) petreus*, n. sp.

This species differs from *N. gladiator*, and approaches *N. spinicarpus* Stimpson, in the enormous development of the spine at the inner angle of the wrist.

It will be sufficient to point out the characters that distinguish it from *N. gladiator*, of which it may prove to be only a variety.

The length of the carapace is nearly  $\frac{3}{4}$  the breadth without the lateral spines. The frontal teeth are blunt and the epistome is not



produced. The last spine of the antero-lateral border is hardly twice the length of any of the others. The costæ of the wrist and hand are low, and the spine at the inner angle of the wrist is about two-thirds the length of the palm.

A single male specimen from the Pedro Shoal north of the Laccadive Islands. The carapace is 12 millim. long and 18 millim. broad including the spines.

17. *Neptunus (Hellenus) hastatoides* (Fabr.) A. M. Edw.

*Portunus hastatoides*, Fabricius, Ent. Syst. Suppl. p. 368.

*Cancer hastatus*, Herbst, Krabben, III. iii. 3, pl. lv. fig. 1.

*Amphitrite hastatoides*, De Haan, Faun. Jap. Crust. p. 39, pl. i. fig. 3: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 38.

*Neptunus hastatoides*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 332, 338: Miers, Zool. H. M. S. Alert, pp. 183, 229, and Challenger Brachyura, p. 175: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 368: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 74: de Man, Zool. Jahrb., Syst., VIII. 1894-95, p. 557.

Carapace very flat, its length in the middle line is about two-thirds its breadth not counting the great lateral spines, finely submentose, its surface symmetrically broken up into low subregional convexities the summits alone of which are granular.

Front slightly prominent beyond the inner supra-orbital angles and cut into four teeth, the middle two of which are very much narrower and acuter than, and are usually as prominent as or even more prominent than, the others: the inconspicuous apical prolongation of the epistome can be seen between, but does not project beyond, the middle teeth. Supra-orbital border cut by two fissures into three lobes, the outer angle of the middle lobe being dentiform.

Antero-lateral borders of moderate length and obliquity, cut into 9 teeth (including the outer angle of the orbit) the last of which is less than three times the length of any of the others in adults, but is longer in the young. The finely-beaded posterior border is practically straight, and forms a sharp or claw-like angle of junction with the postero-lateral borders.

Eyes large and reniform, not concealed by the entirely-dorsal orbits. The antero-lateral angle of the merus of the external maxillipeds is acutely produced in a lateral direction.

Chelipeds in the adult male slightly more than twice the length of the carapace, finely submentose, the hands little if at all less massive than the arm. 3 or 4 spines on the anterior (inner) border of the arm, 2 near the far end of the posterior border: hand and upper surface of wrist costate, the costæ granular: inner and outer angles of wrist strongly spiniform: two spines on the hand, one being in front of the apex of the wrist-joint the other just behind the finger-joint.



Legs more or less subtomentose, quite unarmed, but the after half of the distal border of the merus of the last pair is finely serrulate.

The 3rd segment of the abdomen of both sexes is strongly and sharply carinate: the length of the 6th segment of the male is nearly twice its greatest breadth.

Colours of good fresh spirit specimens, greenish yellow more or less mottled: tip of dactylus of last pair of legs blackish brown.

A small species: egg-laden females have the carapace 22 millim. long and 42 millim. broad including spines.

In the Indian Museum are 137 specimens from the Madras coast, Andamans, G. of Martaban, Penang, and Persian Gulf, besides 6 from Hongkong.

#### 18. *Neptunus (Hellenus) andersoni*, de Man.

*Neptunus andersoni*, de Man, Journ. Linn. Soc., Zool., XXII. 1888, p. 70, pl. iv. figs. 3, 4: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 368.

This species differs from *N. hastatoides* in the following characters:—

The carapace is more convex, the subregional elevations, instead of being low and ill-defined, are sharply-defined tubercles, and the oblique ridge that traverses either epibranchial region is particularly salient. The front is more prominent beyond the inner supra-orbital angles and the two middle teeth are less prominent than the others. The posterior angles of the carapace are much less acute. The antero-external angle of the merus of the external maxillipeds is less produced in a lateral direction. The chelipeds are shorter, being less than twice the length of the carapace in the male, and the costæ of the wrist and hand are smooth. The 6th segment of the male abdomen is less elongate than in *N. hastatoides*.

The colour of good fresh spirit specimens is biscuit yellow without any mottling or marking.

In the Indian Museum are 4 specimens from the Persian Gulf.

#### 19. *Neptunus (Hellenus) spinipes*, Miers.

*Neptunus spinipes*, Miers, Challenger Brachyura, p. 178, pl. xv. fig. 1.

This species has a strong superficial resemblance to *N. hastatoides*, but is easily distinguished (1) by the more convex carapace (2) by the non-fissured supra-orbital border (3) by the form of the merus of the external maxillipeds which has its antero-external angle rounded not produced laterally (4) by the spine on the posterior border of the merus of the last pair of legs, and (5) by the position of the anterior spine of the hand, which is placed a good way back instead of immediately behind the finger-joint.

Carapace appreciably convex, but shaped and sculptured as in *N. hastatoides*. Front very distinctly prominent beyond the inner supra-orbital angles and beyond the epistome, cut into four teeth of which the middle two are somewhat smaller narrower and less prominent than the others.

The supra-orbital border is not fissured, but the orbits otherwise, and the eyes, are as in *N. hastatoides*.

Antero-lateral border cut into 9 teeth (including the outer orbital angle) of which the first 2 or 3 are very small and inconspicuous and the next 5 or 6 small, the last being a spike usually from a third to half the breadth of the carapace proper in length. The posterior border is straight and forms an acutely dentiform angle of junction with the postero-lateral borders.

The merus of the external maxillipeds is narrow and has its antero-external angle simply rounded, not produced laterally.

The chelipeds in the adult male are rather more than  $2\frac{1}{3}$  times the length of the carapace, but are otherwise similar to those of *N. hastatoides*, except that the second spine of the hand is placed a good way behind the finger-joint.

There is a spine near the far end of the posterior border of the merus of the last pair of legs.

The 2nd and 3rd abdominal terga in both sexes are transversely carinate, the carinæ being of no great depth but very elegantly denticulate. The length of the 6th tergum of the male is not much more than its greatest breadth.

A small species: egg-laden females are 6.5 millim. long and 16 millim. broad including spines, but males are nearly twice this size.

In the Indian Museum are 66 specimens, from the Madras coast, Andamans, G. of Martaban, Arakan coast, and Muscat. Most of them come from over 20 fathoms.

The specimen figured by Miers has abnormally short lateral epibranchial spines.

## 20. *Neptunus (Hellenus) longispinosus* (Dana).

*Amphitrite longispinosa*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 84, and U. S. Expl. Exp. Crust. pt. I. p. 277, pl. xvii. figs. 2 a-c.

*Neptunus longispinosus*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 337, 339.

*Xiphonectes longispinosus*, Miers, Challenger Brachyura, p. 183: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 370.

*Amphitrite vigilans*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 84, and U. S. Expl. Exp. Crust. pt. I. p. 278, pl. xvii. figs. 3 a-d.

*Neptunus vigilans*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 336, 339.

and in Maillard's Île Réunion, Annexe F. p. 2: Richters in Möbius, Meeresf. Maurit. p. 152: var. *obtusidentatus*, Miers. Zool. H. M. S. Alert, p. 538, pl. xlviii. fig. A.

*Xiphonectes leptocheles*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 159, pl. iv. fig. 1.

Carapace flattish, its length is from  $\frac{2}{3}$  to  $\frac{3}{4}$  its breadth without the spines, its surface is subtomentose and is cut up into well defined sub-regional elevations, the convexities of which are granular.

Front prominent beyond the hardly independent inner supra-orbital angles and beyond the epistome, cut into four usually acute, triangular teeth—the middle two small and receding, the outer ones very large and prominent. Supra-orbital margin cut by 2 fissures.

Antero-lateral borders moderately oblique, armed with a variable number of small and inconspicuous teeth, and ending in a lateral epibranchial spine that is about half the breadth of the carapace in length. The number of teeth, including the outer orbital angle and the lateral spine, varies from 6 in the young to 9 in the adult, though there are adults with less than 9.

The posterior border is nearly straight and makes a dentiform or sub-dentiform angle of junction with the postero-lateral borders.

Orbits dorsal not concealing the large reniform eyes. Antero-external angle of merus of external maxillipeds not produced in a lateral direction.

Chelipeds of male about  $2\frac{1}{2}$  times the length of the carapace, granular, the granules being in places sub-squamiform, the hand as a whole not less massive than the arm: 3 or 4 spines on the anterior (inner) border of the arm and one at the far end of the posterior border: inner and outer angles of wrist spiniform: hand and fingers costate, the costæ granular, there are 3 spines on the hand, one being in front of the apex of the wrist-joint, the other two standing side by side (the inner the larger) in the distal half of the upper surface.

First three pair of legs slender.

2nd and 3rd abdominal terga transversely carinate, the carinæ not being very prominent: the sides of the male abdomen sinuous.

A small species: egg-laden females have the carapace 9 millim. long and 20 millim. broad including the spines, but many males are a good deal larger, and, on the other hand, egg-laden females are occasionally much smaller.

Colours of good fresh spirit specimens yellow, with much brown and green mottling on dorsal surface of carapace, chelipeds and legs.

In the Indian Museum are 81 specimens from the Andamans, Maldives, and Persian Gulf, besides 2 from Mauritius.

For a long time I thought I could recognize three distinct species differing from one another (1) in relative length of carapace, (2) in relative length and in sculpture of chelipeds, especially of the hands, and (3) in the degree of prominence of the inner supra-orbital angle. But after a careful examination of 83 specimens I find that all these differences are inconstant, as Miers has already said.

## 21. *Neptunus (Hellenus) tenuipes*, De Haan.

*Amphitrite tenuipes*, De Haan, Faun. Japon. Crust. p. 39, pl. i. fig. 4: Haswell, Cat. Austral. Crust. p. 83.

*Neptunus tenuipes*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 335, 339: Thallwitz, Abh. Zool. Mus. Dresden, 1890-91, No. 3. p. 48: Ortman, Zool. Jahrb., Syst. VII. 1893, p. 74.

Carapace little convex, its length about  $\frac{2}{3}$  its breadth without the spines, its surface sufficiently tomentose to appear almost smooth, but when denuded it is found to be cut up into well defined sub-regional elevations the convexities alone of which are granular.

Front prominent beyond the inner supra-orbital angles and beyond the epistome, cut into *three* bluntly triangular teeth, of which the middle one is slightly the smaller and less prominent. Supra-orbital border cut by two-fissures.

Antero-lateral border cut into 9 close-set teeth (including the outer orbital angle) of which the last is about three times as long as any of the others. The posterior border is slightly curved and meets the postero-lateral borders at a well-marked angle, which is sometimes slightly turned up.

Eyes large, reniform, not concealed by the almost completely dorsal orbits. Outer angle of merus of external maxillipeds not produced laterally.

Chelipeds in the adult male about  $2\frac{1}{4}$  times the length of the carapace, the hand being the most massive segment. Arm with 3 spines on the anterior (inner) border and 1 at the far end of the outer border: both inner and outer angle of wrist spiniform, the inner most conspicuously so. Hand costate, the costæ serrulate; armed with 2 spines, one being in front of the apex of the wrist-joint, the other slightly behind the finger-joint.

First 3 pair of legs slender, the first pair hardly shorter than the chelipeds.

Abdomen of male sinuous.

In the Indian Museum are 14 specimens from the Andamans.

## 22. *Neptunus (Hellenus) tuberculosus*, A. M. Edw.

*Neptunus tuberculosus*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 333, 339,



pl. xxxi. fig. 5 : Miers, Challenger Brachyura, p. 176 : J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 369.

Carapace flat, its length in the middle line between  $\frac{2}{3}$  and  $\frac{1}{2}$  its breadth without the great lateral spines, its surface rough, granular, and symmetrically puckered or tubercled.

Front prominent beyond the inner supra-orbital angles and beyond the epistome, cut into four bluntly triangular teeth of nearly equal size, of which the middle two are the more prominent. Supra-orbital margin cut by two fissures.

Antero-lateral borders rather long, moderately oblique, cut into 9 teeth (including the outer orbital angle) the last of which is about 3 times longer than any of the others : the teeth are often rather irregular. Posterior border nearly straight and forming a dentiform angle of junction with the postero-lateral borders.

The orbits are not completely dorsal. The merus of the external maxillipeds is elongate, but has not the antero-external angle produced laterally.

Chelipeds of the male a little over twice the length of the carapace, granular, the hand the most massive joint. 3, occasionally 4, teeth on the anterior (inner) border of the arm, and 1 at the far end of the posterior border. Hand and upper surface of wrist costate, the costæ granular : both inner and outer angle of wrist spiniform : two spinules, which are often blunt and inconspicuous, on the hand in the usual position : fingers a good deal shorter than the palm.

Legs unarmed : sternum granular.

A small species ; ovigerous females have the carapace 11 millim. long and 21 millim. broad including spines.

Colours of good fresh spirit specimens yellow, profusely mottled and speckled with brown green and purple.

In the Indian Museum are 43 specimens from the Andamans, off Ceylon 28 fathoms, and the Persian Gulf.

### 23. *Neptunus (Hellenus) Brockii*, de Man.

*Neptunus brockii*, de Man, Archiv. f. Naturges. LIII. 1887, i. p. 328, pl. xiii. fig. 4.

Closely resembles *N. tuberculosus*, but is distinguished by the following characters, specimens of the same size and sex being compared :—

(1) the front is not cut into teeth, but forms a simple lamina that projects slightly beyond the inner supra-orbital angles ;

(2) the surface of the carapace is cut up into low granular sub-regional elevations, but the tubercles characteristic of *N. tuberculosus* are absent :

(3) there are no spines on the hand. [But there are specimens of *N. tuberculosus* in which the spines of the hand are blunt and inconspicuous].

In the Indian Museum are two males from the Andamans. After comparing these with 43 specimens, of both sexes and all sizes, of *N. tuberculosus* I think they should be kept distinct.

#### 24. *Neptunus (Lupocycloporus) Whitei.*

*Achelous Whitei*, A. Milne Edwards, Archiv. n. Mus. X. 1861, pp. 343, 347, pl. xxi. fig. 6: A. O. Walker, Journ. Linn. Soc., Zool., XX. 1886-90, p. 110: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 371.

*Neptunus Whitei*, Miers, Challenger Brachyura, p. 171.

Carapace fairly convex, its length about  $\frac{2}{3}$  its breadth without the spines, its surface finely pilose, but not sufficiently so to conceal a characteristic series of transverse finely-beaded ridges, of which there are 3 on the gastric, 3 on either branchial region, and one on the cardiac.

The front, which is prominent beyond the bluntly dentiform inner supra-orbital angles and beyond the epistome, is cut into four very definite teeth of nearly equal size, of which the middle two are slightly the more prominent. Supra-orbital border cut by two fissures.

Antero-lateral borders moderately oblique, cut into nine regular teeth (including the outer orbital angle) of which the last is barely twice the length of the others in the adult, though in the young it is a good deal longer. Posterior border finely beaded, and forming a common curve with the postero-lateral borders.

Orbits large, almost entirely dorsal in position, not concealing the large reniform eyes from dorsal view.

Chelipeds nearly 3 times the length of the carapace in the adult male, more or less covered with squamiform granules, the wrist and hand much slenderer than the arm. 4 to 6 spines on the anterior border of the arm; 2 on the posterior border, one being terminal the other submedian. Hand and upper surface of wrist costate, the costæ granular: both inner and outer angle of wrist spiniform: at least 3 spines on the hand, one being in front of the apex of the wrist-joint and two side by side some distance behind the finger-joint. Fingers slender, compressed, ending in long needle-like points, the tips being slightly but very characteristically bent outwards; otherwise the dactylus is nearly straight and the immobile finger gently upcurved.

Legs, like the chelipeds, more or less pubescent: there is a spine near the far end of the posterior border of the merus of the last pair.

Abdomen of male pointed: in both sexes the 2nd and 3rd abdominal terga are transversely, but not very strongly, carinate.

The largest specimen (male) in the Indian Museum has the carapace 24 millim. long and 44 millim. broad including the spines, but there are numerous egg-laden females that are much smaller than this.

In the Indian Museum are 33 specimens, from the Madras coast and the Andamans, besides one of the Challenger duplicates from New-Guinea.

25. ? *Neptunus (Lupocycloporus) gracilimanus*, (Stimpson).

? *Amphitrite gracilimanus*, Stimpson, Proc. Acad. Nat. Sci. Philad. 1858, p. 38.

? *Neptunus gracilimanus*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 336, 339.

This species, if my identification be correct, though much like *N. whitei*, is easily distinguished by the following difference:—

(1) the transverse beaded ridges of the carapace are much less distinct and are less numerous: they are six in number, the anterior gastric one being absent: the carapace also is decidedly more convex:

(2) the shape of the front is entirely different, for instead of being cut into four subacute teeth of nearly equal size, it is cut into four lobes of which the outer ones are broad and shallow while the middle two are narrow and dentiform: the inner supra-orbital angles also are much blunter:

(3) the last spine of the antero-lateral border is always in adults more than twice the length of any of the others:

(4) both the spines on the posterior border of the arm are near the far end of that border:

(5) the fingers are incurved, and the bending outwards at tip is inappreciable:

(6) it is a much smaller species: the largest egg-laden female has the carapace 11 millim. long and 21 millim. broad including the spines, and there are numerous egg-laden females much smaller than this.

The differences are constant throughout the whole series of specimens of both sexes.

In the Indian Museum are 45 specimens from the Andamans, G. of Martaban, Arakan coast, and from the east coast of the Peninsula at 15–35 fms.

26. *Neptunus (Achelous) granulatus* (Edw.) A. M. Edw.

*Lupea granulata*, Milne Edwards, Hist. Nat. Crust. I. 454.

*Amphitrite gladiator*, De Haan, Faun. Jap. Crust. p. 65, pl. xviii. fig. 1.

*Amphitrite speciosa*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 84, and U. S. Expl. Exp., Crust. pt. I. p. 276, pl. xvii. fig. 1.

*Achelous granulatus*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 344, 347, and in Maillard's Île Réunion, Annexe F. p. 2, and Nouv. Archiv. du Mus. IV.



1868, p. 70 and IX. 1873, p. 161 : Streets, Bull. U. S. Nat. Mus. VII. 1877. p. 109 : Miers, Phil. Trans. Roy. Soc. Vol. 168, 1879, p. 488, and Zool. H. M. S. Alert, pp. 230, 538 : Richters in Möbius Meeresf. Maurit. p. 152 : Muller, Verh. Nat. Ges. Basel VIII. 1886, p. 475 : de Man, Archiv. f. Naturges. LIII. 1887, i. p. 331 : Cano. Boll. Soc. Nat. Napol. III. 1889, p. 214 : J. R. Henderson, Trans. Linn. Soc. Zool. (2) V. 1893, p. 371.

*Neptunus (Achelous) granulatus*, Miers, Challenger Brachyura, p. 180 : Thallwitz, Abh. Zool. Mus. Dresden, 1890-91, No. 3, p. 48 : Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 72, and in Semon's Zool. Forschungsr. (Jena. Denk. VIII.) Crust. p. 45 : de Man, Zool. Jahrb. Syst. VIII. 1894-95 p. 558.

Carapace depressed, a little over three-quarters as long as broad, finely subtomentose, its surface cut up into well-defined sub-regional elevations the convexities of which are granular.

Front slightly receding, slightly prominent beyond the blunt inner supra-orbital angles and beyond the epistome, cut into four lobes (not counting the inner supra-orbital angles) of which the middle two are the smaller and less prominent and are often almost coalescent. Supra-orbital border with two distinct fissures.

Antero-lateral borders very slightly oblique, cut into 9 teeth (including the outer orbital angle) of which the last is but little bigger than any of the others which it quite resembles in shape. The posterior border forms a common curve with the postero-lateral borders.

Orbits not completely dorsal : eyes not very large. Antero-external angle of merus of external maxillipeds considerably produced in a lateral direction.

Chelipeds in the male about  $2\frac{1}{2}$  times the length of the carapace, more or less granular, the hand not or little less massive than the arm. Arm with 4 or 5 spines on the anterior border, and with 2 on the posterior border—one submedian the other subterminal : outer border of wrist subcarinate up to a terminal spinule, inner angle of wrist strongly spiniform : hand costate, with a blunt spinule in front of the apex of the wrist-joint and a sharp spine some distance behind the finger-joint.

First three pair of legs rather slender.

Third abdominal tergum in both sexes strongly and sharply carinate.

Colours of good fresh spirit specimens pale yellow, the dorsal surface of the carapace and chelipeds profusely mottled and speckled with grey and dark red.

A small species : egg-laden females have the carapace 12 millim. long and 15 millim. in total breadth, but adult males are half again as big.

In the Indian Museum are 140 specimens from the Andamans and Nicobars, Persian Gulf, Mergui, Ceylon, and Malabar coast, (besides 3 from Mauritius and 2 from Upolu).



27. *Neptunus (Achelous) orbicularis*, Richters.

*Achelous orbicularis*, Richters in Möbius Meeresf. Maurit. p. 153, pl. xvi. figs. 14, 15: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 371.

Differs from *Neptunus (Achelous) granulatus* in the following characters:—

(1) the carapace is extremely thin and depressed, is perfectly smooth—except for faint marginal depressions—and bare, and is sub-circular in shape, its length being  $\frac{6}{5}$  its breadth:

(2) the outer fissure of the supra-orbital margin is obsolete, and the inner fissure is represented by a closed suture:

(3) the antero-lateral borders are cut into 9 teeth which gradually decrease in size from before backwards:

(4) the chelipeds in the male are about twice the length of the carapace, their surface is non-granular, and the posterior border of the arm is more expanded than in *N. granulatus*.

In the Indian Museum are 6 specimens from the Pedro Shoal (Laccadives) and 2, including an egg-laden female, from the Andamans.

## CHARYBDIS, De Haan (GONIOSOMA, A. Milne Edwards).

*Charybdis* and *Oceanus*, De Haan, Faun. Japon. Crust. pp. 10, 9.

*Goniosoma*, A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XIV. 1860, p. 263, and Archiv. du Mus. X. 1861, p. 367: Miers, Challenger Brachyura, p. 189.

*Charybdis*, M. J. Rathbun, Proc. Biol. Soc. Washington, XI. 1897, p. 161.

Carapace hexagonal, moderately broad, depressed or little convex, usually with transverse granular ridges at any rate in its anterior half.

Front proper (not including the inner supra-orbital angles from which it is distinctly separated) usually between a fourth and a third the greatest breadth of the carapace, cut into six lobes or teeth (exclusive of the supra-orbital angles).

Antero-lateral borders oblique, moderately arched, longer than the postero-lateral, cut into from 5 to 7—usually six—teeth including the outer orbital angles.

Upper border of orbit with two notches or fissures; there is a gap in the lower border, and the inner angle of this border is usually dentiform and moderately prominent. The antennules fold transversely.

Basal antenna-joint short and broad; its outer angle forms a lobule which usually fills the orbital hiatus and meets the front, excluding the flagellum from the hiatus.

Epistome sufficiently long: buccal cavern squarish, broader than long: the efferent branchial canals usually well defined.

Chelipeds massive, longer than any of the legs, usually a little unequal: arm with spines; the inner angle of the wrist strongly spiniform, the outer angle usually armed with spinules; palm prismatic or tumid, generally with costæ and some definitely placed spines; fingers strong, usually about as long as palm, strongly toothed.

Legs compressed: in the last pair the merus and carpus are shortened and broadened (the merus usually having a spine at the far end of the posterior border) and the propodite and dactylus typically foliaceous for swimming.

The abdomen is as in *Neptunus*.

Although the name *Charybdis* has the priority, and although I cannot admit that anything short of absolute identity—letter for letter—justifies any charge of “preoccupation,” I regret to discard a name that, like *Goniosoma*, has been in use without any shadow of misunderstanding, for nearly 40 years.

I do so only because I believe that *Goniosoma*, if the name be accepted, might with perfect propriety be merged again in *Thalamita*, and because, in any case, the name *Goniosoma* may conveniently be used for a subgenus.

I agree with Ortmann that *Thalamonyx* may quite reasonably be regarded as a subgenus of *Charybdis*, but for mere convenience I should prefer to subdivide the latter genus into three sections, or subgenera, characterized as follows:—

- I. The lobule at the external angle of the basal antenna-joint joins the front and completely excludes the flagellum from the orbital hiatus. The posterior angles of the carapace may be accented or not, but the line that bounds the dorsum of the carapace posteriorly forms a curve with the postero-lateral borders. The four median teeth of the front are not very dissimilar from the two outermost on either side. No spine on the posterior border of the arm..... GONIOSOMA.
- II. The lobule at the external angle of the basal antenna-joint is as in *Goniosoma*; but the posterior border of the dorsum of the carapace is straight and forms a well-marked dog's-eared angle of junction with the postero-lateral borders. The four median frontal teeth are broad and truncated. A spine at the end of the posterior border of the arm..... GONIOHELLENUS.
- III. The lobule at the external angle of the basal antenna-joint does not nearly touch the front, so that the flagellum stands in the upper part of the orbital hiatus. The posterior border of the dorsum of the carapace is straight and forms either an angular junction, or a curve, with the postero-lateral borders. The four

median frontal teeth are larger and broader than the two outermost pairs. A spine at the end of the posterior border of the arm may be present, or not..... GONIONEPTUNUS.

*Key to the Indian species of the genus Charybdis (= Goniosoma.)*

- I. The antennal flagellum is completely excluded from the orbital hiatus: the ridge that bounds the dorsum of the carapace posteriorly forms a curve with the postero-lateral borders: no spine on posterior border of arm (*Goniosoma*):—
  - A. No distinct transverse ridges on the carapace behind the level of the last spine of the antero-lateral borders:—
    1. Not more than three large spines on the anterior border of the arm: the orbits have no decided dorsal inclination and their major diameter is never more than one-third the width of the interorbital space:—
      - a. First spine of antero-lateral border anteriorly truncated and notched: sixth abdominal tergum of male with curved and gradually convergent sides ..... *G. cruciferum.*
      - b. First spine of antero-lateral border obliquely truncated with the inner angle acute: sixth abdominal tergum of male with curved and gradually-convergent sides: epibranchial regions extremely tumid dorsally .... *G. Rivers-Andersoni.*
      - c. First spine of antero-lateral border acute: the sides of the sixth abdominal tergum of male parallel or slightly divergent in two-thirds or more of their extent:—
        - i. An acute spine on the posterior border of carpus of last pair of legs ..... *G. merguiense.*
        - ii. A sharply dentiform lobule at the outer end of the lower border of the orbit ..... *G. quadrimaculatum.*
        - iii. The major diameter of the true orbital cavity is barely a fourth the width of the interorbital space ..... *G. annulatum.*
    2. Four or more large spines on the anterior border of the arm: the orbits have a strong dorsal inclination and their major

diameter is nearly half the width of the interorbital space: first tooth of antero-lateral border anteriorly truncated and notched .....

*G. miles.*

B. A transverse ridge on the cardiac region, as well as one or two in the posterior half of either branchial region:—

1. Two additional ridges in the posterior half of either branchial region; all the spines of the antero-lateral border well developed:—

a. Carapace moderately broad: first spine of antero-lateral border truncated, the last not enlarged: orbits without dorsal inclination: chelipeds strongly granular and nodular

*G. natator.*

b. Carapace very broad: last spine of the antero-lateral border twice as long as any of the others: orbits with strong dorsal inclination: a stout tooth on the lobule of the basal antenna-joint .....

*G. variegatum.*

2. One additional ridge on either branchial region: second spine of antero-lateral border rudimentary .....

*G. orientale.*

C. A transverse ridge on the cardiac region, but none on the posterior half of the branchial region:—

1. Carapace flat: 3 spines on anterior border of arm, 5 on upper surface of hand: sides of 6th abdominal tergum of male curved and gradually convergent .....

*G. affine.*

2. Carapace convex: 2 (hardly ever 3) spines on anterior border of arm:—

a. Carapace about two-thirds as long as broad: 3 spines on the hand: sides of 6th abdominal tergum of male parallel for half their extent

*G. callianassa.*

b. Carapace about four-fifths as long as broad: 2 spines on the hand: sides of 6th abdominal tergum of male curved: the two middle frontal teeth remarkably prominent

*G. rostratum.*

II. Antennal flagellum completely excluded from orbital hiatus: posterior border of dorsum of carapace straight and forming a dog's-eared angular junction with the postero-lateral borders: the posterior border of the arm ends in a spine (*Goniohellenus*):—

A. Last spine of the antero-lateral border smaller than any of the others .....

*G. ornatus.*



- B. Last spine of the antero-lateral border far larger than any of the others ..... *G. koplites*.
- III. The lobular process of the basal antenna-joint does not nearly touch the front, so that the flagellum stands in the upper part of the orbital hiatus (*Gonioneptunus*):—
- A. Posterior border of dorsum of carapace forming an angular junction with the postero-lateral borders: the posterior border of the arm ends in a spine:—
1. Transverse ridges of carapace faint: a large red impermanent spot on either branchial region ..... *G. truncatus*.
  2. Transverse ridges of carapace prominent: a persistent small dark brown spot on either branchial region ..... *G. bimaculatus*.
- B. Posterior border of dorsum of carapace forming a curve with the postero-lateral borders: no spine on the posterior border of the arm: carapace little transverse, the extent of the fronto-orbital border nearly equal to the greatest breadth of the carapace ..... *G. investigatoris*.

[Besides the species mentioned in the above Key, other two, which I have not seen, are included in the Indian Fauna by other authors. They are *G. erythrodactylum* (Lamk.) and *G. sexdentatum* (Herbst) A. M. E.

*G. erythrodactylum* is recognized, according to A. Milne Edwards, by having seven teeth, of which the second and fourth are rudimentary, on the antero-lateral borders.

*G. sexdentatum*, A. Milne Edwards, if not of Herbst, is very probably the same as de Man's *G. merguense*.]

## 28. *Charybdis* (*Goniosoma*) *crucifera*, (Fabr.) A. M. Edw.

Rumph, Amboinsche Rariteitk. pl. VI. fig. P.

*Cancer sexdentatus*, Herbst, Krabben pl. viii. fig. 53 (1790).

*Cancer cruciatus*, Herbst, Krabben pl. II. V. 155, pl. xxxviii. fig. 1 (1794.)

*Portunus crucifer*, Fabricius, Ent. Syst. Suppl. p. 364 (1798); Bosc, Hist. Nat. Crust. I. p. 218; Latreille, Hist. Nat. Crust. VI. p. 14 and Encycl. Meth. X. p. 191.

*Thalamita crucifera*, Milne Edwards, Hist. Nat. Crust. I. 462; Lucas, Hist. Nat. Anim. Art. Crust. p. 104; Haswell, Cat. Austral. Crust. p. 81.

*Oceanus crucifer*, De Haan, Faun. Japon. Crust. p. 40.

*Charybdis crucifera*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 286, pl. xvii. fig. 11 a-c; Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 39.

*Goniosoma cruciferum*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 371. 385; Tozzetti, "Magenta" Crust. p. 82, pl. vi. fig. 2 a-g; Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 61, pl. i. fig. 27. (*gastric teeth*): Muller, Ver. Ges. Nat. Basel, VIII. 1886. p. 475; Miers, "Challenger" Brachyura p. 191; de Man, Archiv. f. Naturges. LIII. 1887, l. p. 334, and Journ. Linn. Soc. Zool., XXII. 1887,

1888, p. 79, pl. v. fig. i, and Zool. Jahrb., Syst., VIII. 1895, p. 559: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 218: Walker, Journ. Linn. Soc., Zool., XX. 1886-90, p. 110: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 81: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 374.

Carapace not distinctly pilose, about two-thirds as long as broad, slightly convex, nearly smooth to the naked eye, the regions ill-defined. A finely granular curved line—broken on the gastric region—traverses it between the last spines of either antero-lateral border, and two similar lines—the anterior widely broken in the middle—cross the anterior part of the gastric region: these are the only ridges on the carapace, and they become faint with age.

The front is rather deeply cut into six prominent regular blunt-pointed teeth, *not* including the inner supra-orbital angles, none of which project much beyond the others.

The antero-lateral borders are cut into six teeth including the outer orbital angles, of which the first is truncated and notched or bifid, the last is almost spine-like but is little more salient than the others, while the other four are broad anteriorly-acuminate lobes.

The posterior border of the dorsal surface of the carapace forms a curve with the postero-lateral borders.

The orbits have but little dorsal inclination: the major diameter of their cavity is a third the width of the inter-orbital space: neither the inner angle nor the lobule at the outer end of their lower border are dentiform, though the latter lobule is well defined.

The lobule at the antero-external angle of the basal antenna-joint has a ridge, but not a tooth.

The chelipeds are nearly  $2\frac{1}{2}$  times the length of the carapace (in the male) and except for definitely placed costæ and spines are smooth: the hands are a little unequal in size. The arm has three enlarged spines on the anterior (inner) border and a spinule at the far end of the inferior border, but the posterior border is unarmed. The wrist has the inner angle strongly spiniform and has three spinules and some smooth ridges on the outer surface. The hands are tumid but not inflated: they are 5-costate and have 4 spines on the upper surface. In both hands the fingers, which are strongly toothed, are as long as their palm.

In the last pair of legs the merus is about three-fourths as long as broad and has a spine at the far end of the posterior border; the carpus is unarmed, and there are one or two inconspicuous denticles near the far end of the posterior border of the propodite.

The abdomen in both sexes has the 2nd and 3rd terga bluntly carinate: in the male the 6th tergum is much broader than long and has curved and gradually convergent sides.

In spirit the gastric region is purplish brown with a large yellow cross.

Size large: good specimens in the Indian Museum have the carapace 65 millim. in extreme length and 95 millim. in extreme breadth.

29. *Charybdis (Goniosoma) Rivers-Andersoni*, n. sp.

Very closely related to *C. crucifera*, from which it only differs in coloration, in having the epibranchial regions most remarkably swollen above the general dorsal surface of the carapace, in having the frontal teeth very acute, the first tooth of the antero-lateral border not emarginate, and the transverse ridges of the carapace even more obscure.

Carapace perfectly free from pubescence, smooth and polished; its length is a little more than two-thirds its breadth; the gastric region is slightly tumid and the epibranchial regions are very strongly tumid above the rest of its surface. A fine and very faint strongly-arched line crosses the carapace between the last spine of either antero-lateral border, and a still fainter one crosses the gastric region anteriorly: these are the only lines on the carapace and are as faint in the young as in the adult.

Front cut into 8 acute teeth—including the inner supra-orbital angles—arranged in four distinct pairs, the outer pair on either side being almost spine-like.

Antero-lateral borders quite like those of *C. crucifera*, except that the first tooth is obliquely truncated with the inner angle very acute.

Posterior border curved as in *C. crucifera*.

Inner angle of lower border acutely dentiform: the orbits otherwise as in *C. crucifera*.

Chelipeds exactly as in *C. crucifera* except that the hands are less inclined to be tumid.

Last pair of legs as in *C. crucifera* except that the merus is hardly two-thirds as broad as long.

Abdomen in both sexes as in *C. crucifera*.

Colours in spirit: salmon-red, the frontal and antero-lateral borders and the boundary between the branchial and hepatic regions with numerous large creamy spots; four similar spots in a square on the gastric region and a very large one on either branchial region near the middle of the postero-lateral border; fingers blood-red in their distal half, the extreme tips milk-white.

In the Indian Museum are 9 specimens from off the Konkan coast, 56-58 fms., on a bottom of fine sand. The carapace of the largest specimen is 50 millim. in length and 78 millim. in extreme breadth.

30. *Charybdis (Goniosoma) quadrimaculata*, A. M. Edw.

*Goniosoma quadrimaculatum*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 375, 385, pl. xxxiv. fig. 3 : Ortmann. Zool. Jahrb., Syst., VII. 1893, p. 82.

*Goniosoma quadrimaculatum*, A. M. Edw. *Portunus lucifer* Fabr., de Man, Journ. Linn. Soc., Zool. XXII. 1887-88, p. 83 footnote.

*Goniosoma luciferum*, J. R. Henderson, Trans. Linn. Soc. Zool., (2) V. 1893, p. 374.

Differs from *C. crucifera* in the following particulars:—

(1) the carapace though in sculpture of surface similar, is very much broader, its length being much less than two-thirds its breadth :

(2) the frontal teeth are deeper cut and those of the second pair slope outwards rather more :

(3) the teeth of the antero-lateral borders are regular and are claw-shaped, instead of being broad anteriorly-acuminate lobes ; the first is acute and except in its smaller size is similar to the next four, and the last is more spine-like and more prominent :

(4) the orbits are smaller, their diameter being only two-sevenths the width of the inter-orbital space ; *both the inner angle and the lobule at the outer end of the lower border are acutely dentiform* :

(5) the chelipeds in the male are not very much more than twice the length of the carapace ; the hand is 6-costate and the costæ are commonly milled in their proximal half, and there are 5 spines on the upper surface of the hand ; the fingers of the larger cheliped are shorter than the palm :

(6) in the last pair of legs the merus is nearly twice as long as broad, and the posterior border of the propodite is strongly serrated throughout :

(7) the 6th tergum of the male abdomen has its sides parallel or even slightly divergent in at least two-thirds of its extent :

Colours in spirit yellowish brown with 2 large white spots on either branchial region.

In the Indian Museum are 20 specimens from all parts of the coast of the peninsula : the carapace of the largest specimen is 60 millim. long and 98 millim. in extreme breadth.

31. *Charybdis (Goniosoma) annulata* (Fabr.) A. M. Edw.

*Portunus annulatus*, Fabricius, Ent. Syst. Suppl. p. 364 (sec. A. Milne Edwards.).

?? *Cancer fasciatus*, Herbst Krabben, III. i. 62, pl. xlix. fig. 5. (sec. A. M. Edw.).

? *Cancer sezdentatus*, Herbst, Krabben, pl. vii. fig. 52.

*Portunus annulatus*, Latreille, Hist. Nat. Crust. VI. p. 15 (sec. A. Milne Edwards.).

*Thalamita annulata*, Milne Edwards, Hist. Nat. Crust. I. 463 (sec. A. M. Edw.).

*Goniosoma annulatum* (Fabr.), A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 374, 385 : Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 238 : de Man, Notes Leyden



Mus. V. 1883, p. 151 and Zool. Jahrb., Syst., VIII. 1894-95, p. 561 : Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 82 : J. R. Henderson, Trans. Linn. Soc. Zool., (2) V. 1893, p. 375.

*Goniosoma orientale* Heller (*nec* Dana), "Novara" Crust. p. 29, pl. iii. fig. 3 (*sec.* de Man).

Differs from *C. crucifera* in the following particulars :—

(1) the carapace is more convex, and the transverse lines are even fainter, especially on the gastric region :

(2) the frontal teeth are deeper-cut and sharper (in adults) :

(3) the teeth of the antero-lateral borders are regular ; the first is small and acute, the second is not much larger than the first, and the last (in adults) is smaller than any of the three immediately in front of it :

(4) *the major diameter of the orbit is only a fourth the width of the inter-orbital space* : the inner angle of the lower border of the orbit is dentiform and strongly salient, and the lobule at the outer end of this border is ill-defined :

(5) the chelipeds are not much more than twice the length of the carapace (in the male) ; the hand has 5 spines on the upper surface, but two of them—those immediately behind the finger-joint—are tubercles rather than spines ; the fingers of the larger cheliped are as long as the palm, those of the smaller cheliped are longer than the palm :

(6) in the last pair of legs the merus is nearly twice as long as broad and the posterior border of the propodite is serrated in a large part of its extent :

(7) the 6th abdominal tergum of the male is as long as or nearly as long as broad and has its sides parallel in about three-fourths of their extent.

From *Charybdis quadrimaculata* this species is distinguished by the narrower carapace, by the smaller orbits and the different form of the lower orbital border, and by the greater length of the 6th tergum of the male abdomen.

In the Indian Museum are 7 specimens from Karachi and 1 from Bimlipatam, besides 1 from Penang. The carapace of the largest specimen is 48 millim. long and 70 millim. in extreme breadth.

But for high contrary authority, I should consider this species to be identical with the *Cancer sedentatus* of Herbst's pl. vii. fig. 52.

### 32. *Charybdis* (*Goniosoma*) *merguiensis*, de Man.

*Goniosoma merguiense*, de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 82, pl. v. fig. 3, 4, and Zool. Jahrb., Syst., 1894-95 p. 560.

*Goniosoma Helleri*, Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 375.

Very closely resembles *C. quadrimaculata*, but may be distinguished from that species by the following characters:—

- (1) the length of the carapace is two-thirds the breadth:
- (2) the frontal teeth, in the adult are more acute:
- (3) the little lobule at the outer end of the lower border of the orbit is not dentiform:

(4) there is *an acute spine on the posterior border of the carpus of the last pair of legs* (as well as the usual one on the merus):

(5) the 6th abdominal tergum of the male is, like that of *C. annulata*, as long as broad, or nearly so, with the sides parallel or slightly divergent in about three-fourths of their extent.

For the rest, this species differs from *C. crucifera* in the same particulars as *C. quadrimaculata* does, though the last spine of the antero-lateral border is often more prominent than in *C. quadrimaculata*.

In the Indian Museum are specimens, 22 in number from Mergui, Andamans, Karachi and the Persian Gulf—besides 1 from Singapore 2 from Hongkong. The largest has the carapace 46 millim. long and 69 millim. in extreme breadth.

But for high contrary authority I should have felt inclined to refer this species to the *Cancer fasciatus* of Herbst (Krabben III. i. 62, pl. xlix. fig. 5).

### 33. *Charybdis (Goniosoma) affinis*, Dana.

*Charybdis affinis*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 85, and U. S. Expl. Exp. Crust. pt. I. p. 286, pl. xvii. figs. 12 a-c.

*Goniosoma affine*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 384, 385: de Man, Journ. Linn. Soc., Zool. XXII. 1887-88, p. 80, pl. V. fig. 2. and Zool. Jahrb., Syst., VIII. 1894-95, p. 559: J. R. Henderson, Trans. Linn. Soc., Zool. (2) V. 1893, p. 374.

Differs from *C. crucifera* in the following particulars:—

(1) the carapace is flatter, its transverse ridges are much more distinct and there is an additional one across the cardiac region, and the regions are better defined:

(2) the frontal teeth are more acute and are not so parallel:

(3) the first tooth of the antero-lateral border though distinctly emarginate anteriorly has its inner angle acute, and the last tooth is conspicuously larger and more prominent than the last but one, the other teeth are more regularly cut and the antero-lateral border as a whole is less oblique:

(4) the inner angle of the lower border of the orbit is distinctly dentiform:

(5) the chelipeds are only about twice the length of the carapace in the male: the hands are 6 or 7-costate and have 5 spines on the

upper surface, the palms are more swollen (in the adult) and in the smaller cheliped the fingers are decidedly longer than the palm:

(6) the surface of the carapace and chelipeds is much more pubescent, and the size is much smaller.

In the Indian Museum there are 6 specimens, from Mergui, Akyab, and the Orissa coast: the carapace of the largest is 32 millim. long and 48 millim. in extreme breadth.

34. *Charybdis (Goniosoma) callianassa* (Herbst) A. M. Edw.

? *Cancer callianassa*, Herbst, Krabben. III. ii. 45, pl. liv. fig. 7.

*Goniosoma callianassa*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 382, 385 (part).

*Goniosoma variegatum*. Miers, Zool. H. M. S. Alert p. 232: Cano, Boll. Soc. Nat. Napoli, III. 1889, p. 219: Thallwitz, Abh. Zool. Mus. Dresden, 1890-91, No. 3, p. 47: Henderson, Trans. Linn. Soc., (2) V. 1893, p. 376.

A small species, the carapace usually being about 23 millim. long and about 36 millim. in extreme breadth.

Length of carapace about two-thirds the extreme breadth (except in the majority of adult females, in which the last spine of the antero-lateral borders is much prolonged).

Carapace decidedly convex, especially in its posterior half, covered with short pile and crossed transversely by fairly well marked very faintly granular ridges, which are disposed as in *C. crucifera*, except that there is an additional one across the cardiac region.

Front cut into six teeth (*not* including the inner supra-orbital angles) of which the middle two are slightly the most prominent, the second on either side are broadish with a strong outward slope, and the third on either side are the narrowest and most acute.

Antero-lateral borders cut into six teeth (including the outer orbital angle) of which the first is anteriorly notched with the inner angle acute, and the last is spinelike and from  $1\frac{1}{3}$  to twice (in many adult females nearly three times) the length of the last but one: all the teeth have their free edges finally serrulate (except in the case of the posterior edge of the last).

The posterior border of the dorsal surface of the carapace forms a curve with the postero-lateral borders.

Orbits with a perceptible, but not strong, dorsal inclination: the major diameter is a little more than a third the width of the interorbital space: the inner angle of the lower border is dentiform, but the lobule at the outer end of this border is hardly distinguishable.

There is a granular ridge, but no tooth, on the lobule at the outer angle of the basal antenna-joint.

The chelipeds are about  $2\frac{1}{4}$  times the length of the carapace (in the adult male), and when denuded are smooth and polished except for costæ on the wrist and hand, and for granules on the far end of the upper surface of the arm. There are only two enlarged spines on the anterior border of the arm, and the posterior border of the arm is spineless. Wrist with granular costæ on the upper and outer surface, with the inner angle strongly spiniform, and with three spinules at the outer angle. Palm inflated, barrel-shaped, 6-costate, the four upper costæ granular; only three spines—and those small—on the upper surface. Fingers of the larger cheliped a good deal shorter than the palm.

Merus of last pair of legs  $\frac{2}{3}$  to  $\frac{3}{4}$  as broad as long, with a spine, as usual, near the far end of the posterior border: the same border of the propodite is smooth.

The 2nd and 3rd abdominal terga in both sexes—as well as, to a less extent, the 4th in the female—are transversely carinate: the 6th tergum in the male is transversely oblong with the anterior (true posterior) angles rounded.

In the Indian Museum are 66 specimens, chiefly from the Madras and Orissa coasts, but also from Bombay and Karáchi.

The carapace of an exceptionally large male is 29 millim. long and 46 millim. in extreme breadth.

This species is easily distinguished from *C. variegata* De Haan, with which it appears to have been confounded, by the following characters:—

(1) the carapace is very decidedly convex in its posterior half, the regions are less clearly defined, and there is only one transverse ridge on the epibranchial regions—namely the usual one that runs in from the last antero-lateral tooth:

(2) the four middle frontal teeth are blunter and more divergent, and the third on either side is larger and more prominent:

(3) the edges of the teeth of the antero-lateral border are serrulate:

(4) the eyes are smaller and the orbits have a much less marked dorsal inclination; the little lobule at the outer end of the lower border of the orbit is obsolete, instead of being a sharp independent denticle.

(5) there is a ridge, but no tooth, on the lobe of the basal antenna-joint.

(6) there are only 2 large spines on the anterior border of the arm, there are no squamiform granules on the under surface of the arm and hand, there are three spinules on the outer surface of the wrist; the palms are more inflated, their costæ less numerous and less salient, and both the spines immediately behind the finger-joint are obsolete:

(7) the sixth abdominal tergum of the male is transverse oblong with the anterior angles rounded off.



*C. callianassa* has a considerable resemblance to *C. affinis* Dana, from which it may be distinguished by the following characters:—

(1) the carapace is convex instead of nearly flat, the frontal teeth differ, and the teeth of the antero-lateral border are serrulate :

(2) the orbit is more dorsally inclined :

(3) there are only two enlarged spines on the anterior border of the arm : the hands are barrel-shaped and have only 3 spines on their upper surface :

(4) the 6th abdominal tergum of the male has the sides parallel or almost divergent in two-thirds of their extent, whereas in *C. affinis* they form gradually converging curves.

### 35. *Charybdis (Goniosoma) rostrata*, A. M. Edw.

*Goniosoma rostratum*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 379, 385, pl. xxxv. fig 2 : J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 377.

A small species : the length of the carapace in adults being somewhere about 20 millim., and the extreme breadth about 25 millim.

Carapace about four-fifths as long as broad in the male, but not quite so long in the female, moderately convex, crossed transversely by granular ridges which are disposed as in *C. crucifera*, except that there is an additional one across the cardiac region (just as in *C. affinis* and *C. callianassa*), densely though finely pilose.

Front as a whole decidedly prominent, cut into six teeth (not including the inner supra-orbital angles), of which the middle two are bluntly pointed and project far beyond the others, the next on either side are broad and slope outwards, and the third on either side are small narrow and nearly straight.

Antero-lateral borders cut into six serrulate teeth, of which the first is very acute and the last is more spinelike than the others.

The posterior border of the dorsal surface of the carapace forms a curve with the postero-lateral borders.

Orbits without any particular dorsal inclination, the major diameter not much less than half the width of the interorbital space, the inner angle of the lower border dentiform, the lobule at the outer end of the lower border distinct but not dentiform.

A strongish granular ridge on the lobule of the basal antenna-joint.

Chelipeds less than twice as long as the carapace even in the male, nearly smooth when denuded. Arm with 2 spines on the anterior border and none on the posterior border. Wrist with a strong spine at the inner angle and with two—less commonly three—spinules at the outer angle. Hands inflated in the male, but not much so in the female,

6-costate, the four upper costæ granular; only two spines—and those small—on the upper surface of the hand. Fingers longer than the palm in the smaller cheliped, as long as the palm in the larger cheliped.

The merus of the last pair of legs is nearly as broad as long and has the usual spine on its posterior border; the posterior border of the propodite is smooth.

The 6th tergum of the male abdomen is broader than long and has curved and gradually convergent sides.

In the Indian Museum are 98 specimens, chiefly from the northern parts of the Bay of Bengal, Mergui, and the Gulf of Martaban, but also from off the Andamans and off Ceylon.

### 36. *Charybdis (Goniosoma) variegata* (De Haan).

? *Portunus variegatus*, Fabricius, Ent. Syst. Suppl. p. 364.

??? *Cancer callianassa*, Herbst. III. ii. 45, pl. liv. fig. 7.

? *Thalamita callianassa*, Milne Edwards, Hist. Nat. Crust. I. 464.

*Charybdis variegatus*, De Haan, Faun. Japon. Crust. pl. i. fig. 2: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 39.

*Goniosoma callianassa*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 382, 385 (part).

*Goniosoma variegatum*, var. *callianassa*, J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 377.

A small species: the carapace in the adult about 20 millim. long and about 35 millim. in extreme breadth.

Carapace about four-sevenths as long as broad (or about two-thirds as long as broad without the enlarged lateral spines), slightly convex, the regions for a *Goniosoma* well defined, crossed transversely by numerous salient granular ridges arranged as in *G. natator*—the ridges standing out from the copious short pile with which the carapace is covered.

Front cut into 6 rather pointed teeth (not including the inner supra-orbital angles) of which the middle two are the most prominent and the outer one on either side is the least prominent and much the slenderest.

Antero-lateral borders cut into six teeth (including the outer orbital angle) which gradually increase in size from before backwards, the last being a salient spine about twice as long as the last but one—*Neptunus* like.

The posterior border of the dorsal surface of the carapace forms a curve with the postero-lateral borders.

Eyes large: the orbit, which has a strong dorsal inclination, is about two-fifths the width of the interorbital space; the inner angle of its

lower border, though not prominently dentiform, is acuminate, and the lobule at the outer end of this border is sharply dentiform.

*There is a prominent tooth on the lobule at the outer angle of the basal antennal joint*: this is present in no other Indian species.

Chelipeds about  $2\frac{1}{3}$  times the length of the carapace (in the male): all three surfaces of the arm and almost all parts of the surface of the hand are covered with granular squamiform markings. Arm with 3 enlarged spines on the anterior border, the posterior unarmed. Wrist costate on the upper and outer surface; the inner angle spiniform; *only two spinules* at the outer angle. Hands (in adults only) more than usually unequal for a *Goniosoma*: in one cheliped (adult) the palm is swollen and markedly longer than the fingers, in the other it is not swollen and is not much longer than the fingers: the hand is 7-costate and there are 4 spines on its upper surface.

The merus of the last pair of legs is about four-fifths as broad as long and has a spine near the distal end of its posterior border, the propodite has one or two inconspicuous spinules near the far end of its posterior border.

In both sexes the 2nd and 3rd abdominal terga are transversely keeled: in the male the 6th tergum is a good deal broader than long and has strongly curved sides.

In the Indian Museum are 43 specimens from the Madras coast and the Persian Gulf, besides one from Nagasaki and one from Hongkong.

### 37. *Charybdis (Goniosoma) natator* (Herbst) A. M. Edw.

*Cancer natator*, Herbst, Krabben. II. v. 156, pl. xl. fig. 1.

*Portunus sanguinolentus*, Bosc, Hist. Nat. Crust. I. p. 218.

*Thalamita natator*, Milne Edwards, Hist. Nat. Crust. I. 463, pl. xvii. figs. 13, 14.

*Charybdis natator*, De Haan, Faun. Japon. Crust. p. 10.

*Charybdis granulatus*, De Haan, Faun. Japon. Crust. p. 42, pl. i. fig. 1: Krauss, Sudafr. Crust. p. 24: Stimpson, Proc. Ac. Nat. Sci. Philad. 1853, p. 39.

*Goniosoma natator*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 370, 385: Hilgendorf, MB. Ak. Berl. 1878, p. 801: Miers, Zool. H. M. S. Alert, pp. 518, 539: F. Muller, Verh. Ges. Nat. Basel, VIII. 1886, p. 475: de Man, Archiv. f. Naturges. LIII. 1887, i. p. 334, pl. xiii. fig. 5, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 285: Walker, Journ. Linn. Soc. Zool. XX. p. 110: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 374.

Length of carapace about five-sevenths the breadth.

Carapace slightly convex, with a somewhat mangy pile, crossed transversely by several rather coarse granular more or less broken ridges: the most conspicuous of these ridges runs—broken only by the cervical groove—right across between the last teeth of the antero-lateral borders, and in front of this are two—the anterior one widely divided in the middle—on the gastric region, while behind it are two short ones

on either branchial region and a bow-shaped one on the cardiac region.

Front cut into 6 bluntly-rounded teeth (*not* including the inner supra-orbital angles) of nearly equal size.

Antero-lateral borders cut into 6 teeth, of which the first (the outer orbital angle) is blunt or truncated, the last is rather smaller than those immediately in front, and the intervening four though anteriorly acute—especially in the young—tend to grow blunt.

The posterior border of the dorsal surface of the carapace forms a curve with the postero-lateral borders.

Orbit without any particular dorsal inclination, its major diameter is about two-sevenths the width of the interorbital space: the inner angle of the lower border is not prominent and hardly dentiform, the lobule at the outer end of this border though well defined is not dentiform.

Chelipeds about  $2\frac{2}{3}$  times as long as the carapace (in the adult male), their under surface is covered with transverse squamiform tubercles which are specially regular and distinct on the hand, their other surfaces also are beset with tubercles which are more or less distinctly squamiform: the space between the tubercles is furred. Three *enlarged* teeth (besides smaller ones) on the anterior border of the arm, the posterior border unarmed. Inner angle of wrist strongly spiniform, outer angle with three small spines. Hand beset with longitudinal series of tubercles, and having 4 or 5 spines on the upper surface: fingers about as long as hand.

The merus of the last pair of legs is about two-thirds as broad as long and has a strong spine on the posterior border, and the same border of the propodite is armed with spinules that become very indistinct with age.

In both sexes the 2nd-4th abdominal terga are transversely keeled: in the male the 6th tergum is as long as broad and has the sides parallel or even slightly divergent in three-fourths of their extent.

Colours in spirit, mottled, with much admixture of red, the ridges of the carapace dark red.

In the Indian Museum are 10 specimens from Ceylon, Madras, and Pondicherry, besides 1 from Singapore. In the largest specimens the carapace is about 70 millim. long and about 100 millim. broad.

### 38. *Charybdis* (*Goniosoma*) *miles* (De Haan).

*Portunus* (*Charybdis*) *miles*, de Haan, Faun. Japon. Crust. p. 41, pl. xi. fig. 1: Stimpson Proc. Ac. Nat. Sci. Philad. 1858, p. 39.

*Goniosoma miles*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 378, 385: Ortmann, Zool. Jahrb., Syst., VII. 1893, p. 81.

Size medium: an adult female in the Indian Museum has the carapace 43 millim. long and 59 millim. broad.



Carapace not very broad, its length about three-fourths its breadth, little convex, smooth or granular in places when denuded of copious short pile; its anterior half only is crossed transversely by faint granular lines disposed as in *C. crucifera*.

Front cut into six acute teeth, *not* including the acutely dentiform inner supra-orbital angles, of which the two middle ones hardly project beyond the others and the outermost on either side are the narrowest and most acute.

Antero-lateral borders very little oblique, cut into 6 acutely acuminate teeth, of which the first (the outer orbital angle) is broad and anteriorly notched with the inner angle acuminate, and the last is not larger or more prominent than the others.

The posterior border of the dorsal surface of the carapace forms a curve with the postero-lateral borders.

Eyes large: the orbit has a considerable dorsal inclination and its major diameter is nearly half the width of the interorbital space; of the two fissures in its roof the inner is a distinct gap; the inner angle of the lower border is acutely dentiform.

The antero-external angle of the merus of the external maxillipeds is somewhat produced laterally.

The chelipeds are long and, for a *Goniosoma*, are slender; their undersurface is finely granular (as also is a large part of the upper surface of the arm) the granules of the hand showing a squamiform arrangement. The arm has four *large* spines on the anterior border and a spinule at the end of the lower border, but the posterior border is unarmed. The hand is 6-costate, most of the costæ being finely granular, and has 4 acute spines on the upper surface. Fingers slender, very acute, sharply toothed, longer than the palm, which is not swollen.

The last pair of legs have the merus about two-thirds as long as broad and are unarmed except for a spine on the posterior border of the merus and two or three denticles near the far end of the posterior border of the propodite.

The 6th tergum of the male abdomen is much broader than long and has curved and gradually converging sides.

Colours in life red, the tips of spines light, chelipeds mottled red, fingers banded dark and light red.

In the Indian Museum are a male and egg-laden female from the Gulf of Martaban, 53 and 67 fms.

### 39. *Charybdis* (*Goniosoma*) *orientalis* (Dana).

? *Charybdis orientalis*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 85, and U. S. Expl. Exp. Crust. pt. I. p. 285, pl. xvii. fig. 10.

*Goniosoma orientale*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 383, 385 :

de Man, Notes Leyden Mus. I. 1879, p. 60, V. 1883, p. 151, and XV. 1893, p. 286 : Lenz and Richters, Abh. Senck. Nat. Ges. Frankfurt, XII. 1881, p. 422 : Cano, Boll. Soc. Nat. Napol. III. 1889, p. 220 : J. R. Henderson, Trans. Linn. Soc. Zool. (2) V. 1893, p. 375.

? *Goniosoma dubium*, Hoffmann in Pollen and Van Dam, Rech. Faun. Madagasc., V. 2, 1874, p. 11, pl. ii. figs. 6-8.

Carapace about two-thirds as long as broad, crossed transversely by salient granular lines which have the same disposition as in *C. variegata* De Haan, except that there is only one on either branchial region behind the level of the last spine of the antero-lateral borders.

Front cut into 6 truncated teeth, *not* including the inner supra-orbital angles.

Antero-lateral borders very little oblique, cut into six teeth (including the outer orbital angles) *of which the second is rudimentary and looks like a denticle cut out of the base of the first*, while the last is not enlarged in adults, though in the young it *may* be.

The posterior border of the dorsal surface of the carapace though straight forms a curve with the postero-lateral borders.

Orbit without any particular dorsal inclination, its major diameter a little more than a third the width of the inter-orbital space, the inner angle of the lower border broadly dentiform, the lobule at the outer end of this border distinct but not dentiform.

Arm with 3 spines on the anterior border and none on posterior border: wrist with a strong spine at the inner angle and 2 or 3 spinules on the outer: hand not tumid, 5 spines, of which 4 are large, on the upper surface.

In the fifth pair of legs the merus is nearly twice as long as broad, and has the usual spine on the posterior border: the same border of the propodite is serrated.

In the Indian Museum are five specimens, from the Pedro Shoal, from the Madras coast of the Gulf of Manár, and from off the Arakan coast.

This species is distinguished from *C. anisodon*, which, though not known to occur in Indian Seas, is found at Singapore, by the presence of granular ridges on the carapace, by the five spines (instead of 2) on the hand, and by the serrated (instead of smooth) posterior border of the propodite of the last pair of legs. It is one of the conspicuous links between *Goniosoma* and *Thalamita*.

#### 40. *Charybdis* (*Gonichellenus*) *ornata*, A. M. Edw.

*Thalamita truncata*, De Haan, Faun. Japon. Crust. p. 43, pl. ii. fig. 3 and pl. xii. fig. 3 only ♂.

*Charybdis truncata*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 39.

*Goniosoma ornatum*, A. Milne Edwards. Archiv. du Mus. X. 1861, pp. 376, 385 : Miers, P. Z. S. 1879, pp. 20, 33, and Challenger Brachyura p. 191 : Ortmann, Zool. Jahrb., Syst., VII. 1893, p. 83 : J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 376 : de Man, Zool. Jahrb., Syst., VIII. 1895, p. 562.

A smallish species : the length of the carapace in adults is about 26 millim., its extreme breadth about 36 millim.

Length of carapace rather over two-thirds the extreme breadth. Carapace moderately convex with the regions fairly well defined, crossed transversely by well marked granular ridges which have much the same disposition as those of *C. crucifera*, except that there are in addition (1) a broad one—divided in the middle line—on the cardiac region, and (2) a short and broad one—or traces of two—on either branchial region.

The front is cut into eight lobes (*including* the inner supra-orbital angles) arranged in four pairs, of which the outermost pair on either side are bluntly dentiform, and the two middle pairs are broad shallow and lobe-like.

The antero-lateral borders are cut into six teeth (including the outer orbital angles) of which the first is obliquely truncated and the last is the smallest ; the edges of all are entire.

The posterior border of the dorsum of the carapace is straight, and forms a somewhat up-turned or dog's-eared angle of junction with the postero-lateral borders.

The orbits have a strong dorsal inclination and their major diameter is not much less than half the width of the inter-orbital space : the inner angle of their lower border is broad and hardly dentiform.

The chelipeds are about  $2\frac{1}{3}$  times the length of the carapace (in the male) and all their surfaces are covered with granular transverse squamiform markings. There are 2—less commonly 3—enlarged spines on the anterior border of the arm and the posterior border ends in a spinule. Inner angle of wrist strongly spiniform, three spinules on the outer angle. Hand 6 or 7 costate—the costæ with squamiform crenations—and with 4 spines on the upper surface. In adults the palm is full and is longer than the fingers in the larger cheliped, but shorter than the fingers in the smaller cheliped.

Merus of last pair of legs about two-thirds as broad as long, with the usual strong spine on the posterior border : the same border of the propodite is finely serrated.

In both sexes the 2nd and 3rd—and to a much less extent the 4th—abdominal terga are transversely keeled : the 6th tergum in the male is broader than long and has strongly curved sides.

In the Indian Museum are 6 fine specimens from the mouth of the

Hughli and Coromandel coast and 1 from the Arakan coast—also 1 from Hongkong and 1 from Java.

41. *Charybdis (Gonihellenus) hoplites*, Wood-Mason.

*Goniosoma hoplites*, Wood-Mason, Ann. Mag. Nat. Hist. (4) XIX. 1877, p. 422 : Alcock and Anderson, J. A. S. B. Vol. LXIII. pt. 2, 1894, p. 184, and Ill. Zool. Investigator, Crust. pl. xxiii. fig. 6 : Alcock, Investigator Brachyura, p. 67.

A small or smallish species.

The length of the carapace is not much more than half the extreme breadth measured between the tips of the last spine of the antero-lateral borders.

Carapace covered with a dense short tomentum, convex, the regions well defined and fairly well areolated—the convexities of many of the areolæ granular. The gastric region is divided into three sub-regions, the cardiac into two, and there is a very pronounced and independent swelling on the inner part of either branchial region.

A granular ridge crosses the middle of the gastric region transversely, and a similar ridge—strongly arched forwards—crosses each branchial region, beginning on the tip of the last epibranchial spine : these are the only transverse ridges on the carapace, although it sometimes happens that two of the granular subregional convexities of the anterior part of the gastric region are ridge-like.

The front is exactly like that of *C. ornata*, except that the outermost pair of teeth on either side are rather sharper.

The antero-lateral borders are cut into six teeth (including the outer orbital angle) of which the last is a *Neptunus*-like spine at least twice as long as those in front of it : the other 5 are square-cut lobules separated by wide and deep notches, and having their outer edge serrate and their anterior angle acuminate.

The posterior border of the dorsum of the carapace forms a strong dog's-eared angle of junction with the postero-lateral borders.

The orbits are exactly as in *C. ornata*, except that the inner fissure of the roof is wider and the outer fissure less distinct.

The chelipeds in typical specimens are exactly as in *C. ornata*, but it sometimes happens that the granulation of the arm does not cover the whole surface of that joint.

The last pair of legs are as in *C. ornata*, but the breadth of the merus varies from half to two-thirds the length of that joint.

The 6th tergum of the abdomen of the male is truncate-triangular, having almost no curve to the sides.

In the Indian Museum are 45 specimens from off the Coromandel coast, from about 50 to about 110 fathoms, and 4 from off the Indus Delta, 16 to 44 fms.



In an average specimen the length of the carapace is 26 millim., and the extreme breadth 48 millim.

*Charybdis (Goniohellenus) hoplites*, var. *vadornum*.

Differs from the typical deep-sea form in the following particulars:—

- (1) the carapace is depressed, therefore the granular convexities of the areolæ stand out in higher relief :
- (2) the last spine of the antero-lateral borders is rather longer :
- (3) the spine at the inner angle of the wrist is much longer :
- (4) Egg-laden females are hardly half the size.

In the Indian Museum are 9 specimens from the Orissa coast,  $7\frac{1}{2}$  to 20 fms., 6 from the Persian Gulf, and 3 from the Arakan coast.

*Charybdis (Goniohellenus) hoplites* var. *pusilla*.

This is a dwarf variety, egg-laden females having a carapace only about 9 millim. long and about 16 millim. in extreme breadth.

The carapace is of a thin texture, the chelipeds and legs are slenderer, and the dorsal bulge of the branchial regions is stronger and sharper.

In the Indian Museum are 300 specimens from off the Konkan coast 56 to 58 fathoms.

*Gonioneptunus*, Ortmann.

*Gonioneptunus*, Ortmann, Zool. Jahrb. Syst. etc., VII. 1893-94, p. 79.

This "genus," as Ortmann remarks, is a link between *Charybdis* (= *Goniosoma*) and *Neptunus*. It has much the same bearing to *Goniosoma* that the "genus" *Cronius* has to *Neptunus*, and is one of those forms that would justify any general zoologist in uniting all the Lupine "genera" of systematists into one natural genus.

It differs from *Goniosoma* only in the fact that the broad lobular process of the external angle of the basal antenna-joint is not in contact with the front, so that the antennal flagellum is not excluded from the orbital hiatus.

42. *Charybdis (Gonioneptunus) truncata* (De Haan).

*Portunus truncatus*, Fabricius, Ent. Syst. Suppl. p. 365, and Latreille, Hist. Nat. Crust. VI. p. 16, (*fide* A. M. Edw.).

*Thalamita truncata*, Milne Edwards, Hist. Nat. Crust. I. 463 (*fide* A. M. Edw.).

*Portunus (Thalamita) truncatus*, De Haan, Faun. Japon. Crust. p. 43, pl. xii. fig. 3, ♀ only.

*Portunus (Charybdis) truncatus*, De Haan, Faun. Japon. Crust. p. 65, pl. xviii. fig. 2.

*Goniosoma truncatum*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 380, 385, pl. xxxiv. fig. 4.

*Gonioneptunus subornatus*, Ortmann, Zool. Jahrb. Syst. VII. 1893, p. 79, pl. iii. fig. 9.

The lobule of the basal antenna-joint does not touch the front, so that the flagellum stands in the upper part of the orbital hiatus.

The length of the carapace slightly exceeds two-thirds of the extreme breadth.

Carapace covered with a dense short tomentum, moderately convex, the regions ill-defined, crossed transversely by fine granular ridges which have the same disposition and are almost as faint as those of *C. crucifera*: in addition there are small patches of granules on the cardiac and inner part of the branchial regions.

The front is cut into eight teeth (*including* the inner orbital angles) of which the middle four are broadly triangular and almost acute, while the pair on either side are sub-confluent and form a sort of reduplicated inner supra-orbital angle, somewhat as in *Neptunus* (*Lupocycloporus*) *whitei*.

Antero-lateral borders cut into six teeth, of which the second is the smallest, and the 6th—though more spine-like—is hardly more prominent than those in front of it: all except the sixth are cut rather square, have the free edge serrate, and are anteriorly acuminate—much as in *C. hoplites*.

The posterior border of the dorsal surface of the carapace is practically straight and forms an obtuse angle of junction with either postero-lateral border.

Except that the inner angle of the lower edge of the orbit is denticiform and strongly prominent, and that the inner fissure of the roof is wider, the orbits, and the eyes, are as in *C. ornata*.

Chelipeds not much more than twice the length of the carapace, their upper surface more or less granular, their under surface with smooth-worn squamiform markings. Arm with two more enlarged and one or two less enlarged spines on the anterior border, and one at the far end of the posterior border. Wrist with 3 spinules on the outer angle and a large spine at the inner angle. Hands inflated, strongly 6 or 7-costate—the costæ granular, and with 3 small spines on the upper surface: very similar, in fact, to those of *C. callianassa*. The fingers in the smaller cheliped are as long as, but in the larger cheliped are shorter than, the palm.

The merus of the last pair of legs is nearly as long as broad and has the usual spine on the posterior border: the same border of the propodite is smooth.

In both sexes the 2nd and 3rd abdominal terga are carinate—the 2nd strongly and sharply so. The 6th tergum of the male is truncate-triangular, the sides being very slightly sinuous.

In life the dorsal surface of the carapace is terra-cotta red and there is a good-sized crimson spot towards the inner side of the middle of either branchial region: the exposed dorsal surface of the chelipeds is reddish with numerous darker red markings.

In the Indian Museum there are 6 specimens, including an egg-laden female, from the Gulf of Martaban 53–67 fathoms.

In the male the carapace is about 27 millim. long and about 39 millim. in extreme breadth: in the female it is a good deal smaller.

43. *Charybdis (Gonioneptunus) bimaculata*, Miers.

*Goniosoma variegatum* var. *bimaculatum*, Miers, Challenger Brachyura, p. 191, pl. xv. fig. 3.

As in *C. truncata* the lobule at the outer angle of the basal antenna-joint does not touch the front, so that the antennal flagellum stands in the orbital hiatus.

Length of carapace more than  $\frac{2}{3}$  but less than  $\frac{3}{4}$  the breadth.

Carapace flattish, covered with dense short tomentum, crossed transversely by salient granular ridges arranged exactly as in *C. ornata*.

Front almost similar to that of *C. ornata*, except that, as in *C. truncata*, the outer pair of teeth on either side are sub-confluent and form a sort of reduplicated inner supra-orbital angle.

Antero-lateral borders exactly as in *C. truncata*, except that the last (spine-like) tooth is at least half again as long as any of those in front of it.

Posterior border of dorsal surface of carapace exactly as in *C. truncata*.

Eyes and orbits as in *C. ornata*.

Chelipeds about  $2\frac{1}{4}$  times the length of the carapace. The lower border and the distal half of the upper surface of the arm are granular: there are 2 or 3 spines on the anterior border of this joint, and the posterior border ends in a spine. Upper surface of wrist granular, the inner angle of this joint strongly dentiform, and there are 2 or 3 spinules on the outer angle. Hand in the adult inflated and, except that the squamiform markings of the under surface are almost obliterated, exactly similar to that of *C. truncata*.

Abdomen as in *C. truncata*.

Except that the merus is only about  $\frac{2}{3}$  as long as broad, the last pair of legs are as in *C. truncata*.

In the Indian Museum are 2 small specimens, from Palk Straits

and the Orissa coast, as well as one of the "Challenger" duplicates from Japan.

In the Japanese specimen there is a small dark spot near the middle of either epibranchial region.

Though the sculpture of the carapace and the dorsal inclination of the orbits do certainly give this species a considerable resemblance to *C. variegata*, and though the hands strongly resemble those of *C. callianassa* (which has been confused with *C. variegata*), this species is absolutely different from those, and is very nearly allied to *C. truncata*.

#### 44. *Charybdis (Gonioneptunus) investigatoris*, n. sp.

The lobule of the basal antenna-joint does not touch the front, so that the flagellum stands in the upper part of the orbital hiatus.

Length of carapace nearly five-sixths the breadth.

Carapace little transverse, little convex, the regions indistinct, and the transverse markings extremely indistinct.

Front cut into eight teeth (*including* the inner orbital angles) of which (1) the middle two are rounded, rather narrow, and distinctly the most prominent (2) the submedian are broad and slant outwards, and (3) the outermost pair on either side are narrow and subacute, and form a sort of reduplicated supra-orbital angle. *The extent of the fronto-orbital border is almost equal to the greatest breadth of the carapace.*

Antero-lateral borders little oblique, cut into six acute teeth with sharp entire edges, of which the first 3 are much larger than the next 2, while the last is a spine only slightly more prominent than the tooth in front of it.

The posterior border of the dorsum of the carapace, though nearly straight forms a curve with the postero-lateral borders.

The eyes and orbits are large—the major diameter of the orbit being at least half the width of the inter-orbital space—but have no particular dorsal inclination: the inner angle of the lower border of the orbit is not dentiform.

Chelipeds slender, about twice the length of the carapace. Four acute spines, three of which are enlarged, on the anterior border, and none on the posterior border. Wrist with 3 spinules on the outer angle and a very long and acute spine at the inner angle. Hand slender with indistinct costæ on the outer surface, with a ridge along the middle of the inner surface, and with four spines on the upper surface—the two on the inner edge of the upper surface being singularly large and acute. Fingers acute, markedly longer than the hand (palm).

Legs long and slender. The merus of the last pair is more than



twice as long as broad and has the usual spine at the far end of the posterior border: there are 1 or 2 spinules on the same border of the propodite of this pair.

The 6th abdominal tergum of the male is truncate-triangular and its line of separation from the preceding segments is indistinct.

A single male specimen, with the carapace 10 millim. long and 12 millim. broad, from off the Ganjam coast, 35 fathoms.

#### THALAMONYX, A. Milne Edwards.

*Thalamonyx*, A. Milne Edwards, *Nouv. Archiv. du Mus.* IX. 1873, p. 168: Miers, *Challenger Brachyura*, p. 192.

Resembles *Charybdis* (= *Goniosoma*) in all essential characters but differs in the following particulars:—

(1) the front proper (not including the inner supra-orbital angles) is broader, being very much more than a third the greatest width of the carapace, and is cut into two broad lobes, not including the inner supra-orbital angles:

(2) the antero-lateral borders are very little oblique, and are cut into 5 teeth only.

Ortmann, whom I am inclined to follow, regards it as only a sub-genus of *Charybdis* (= *Goniosoma*). de Man, on the other hand, is inclined to regard it as identical with *Thalamita*, and there is much to be said in favour of this view also. The fronto-orbital border, however, is not quite so broad and the antero-lateral borders are not, therefore, so nearly parallel, nor is the posterior part of the carapace so contracted nor the inner supra-orbital angle so broad as in most species of *Thalamita*. It is a form that excellently well illustrates the real generic unity of the two supposed genera.

#### 45. *Thalamonyx gracilipes*, A. M. Edw.

*Thalamonyx gracilipes*, A. Milne Edwards, *Nouv. Archiv. du Mus.* IX. 1873, p. 169, pl. iv. fig. 3.

*Thalamonyx danæ* var. *gracilipes*, Miers, *Challenger Brachyura*, p. 192.

*Goniosoma* (*Thalamonyx*) *danæ*, Ortmann, *Zool. Jahrb., Syst.*, VII. 1893-94, p. 83 (part).

Carapace more than two-thirds as long as broad with the regions fairly well defined and the surface granular, some of the granules forming short transverse lines.

Front sublamellar and prominent, divided into two broad shallow lobes of which the inner angles are a little bit pronounced.

Antero-lateral borders little oblique and little arched, forming an obtuse angle little short of a right-angle with the anterior border, cut into five claw-like teeth of nearly equal size.

The posterior border of the dorsum of the carapace is straight but does not form an angle with the postero-lateral borders.

Orbits large, with no particular dorsal inclination, their major diameter about half the width of the inter-orbital space: the inner angle of the lower border is bluntly acuminate but hardly dentiform.

Chelipeds granular: arm with squamiform markings, with 2 spines on the anterior border and none on the posterior border: wrist costate, with 3 tiny spinules on the outer angle and a strong spine at the inner angle: hands not inflated (in the female at least), carinate, with 3 spines on the upper surface.

Merus of last pair of legs hardly half as long as broad, with the usual spine near the far end of the posterior border.

An egg-laden female in the Indian Museum, from the Andamans, has the carapace 7 millim. long and 9 millim. broad.

Miers and Ortmann regard this species as not distinct from *T. danæ*, A. M. Edw. (Nouv. Archiv. du Mus. V. 1869, p. 183, pl. vii. figs. 6, 7).

#### THALAMITA, Latreille, A. M. Edw.

*Thalamita*, Latreille in Cuvier Règne An., Crust. (ed. 2) Vol. IV. p. 33 (foot-note): A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XIV. 1860, p. 228, and Archiv. du Mus. X. 1861, p. 354: Miers, Challenger Brachyura, p. 193.

*Thalamites quadrilatères*, Milne Edwards, Hist. Nat. Crust. I. 457.

Carapace hexagonal (but, owing to the straightness of the antero-lateral borders, with a quadrilateral cast), broad or very broad, depressed or little convex, usually with well marked transverse ridges.

The extent of the fronto-orbital border is usually little less than the greatest breadth of the carapace: the width of the inter-orbital space is from three-fifths to half the greatest breadth of the carapace: and the width of the true front (*i.e.* excluding the broad inner supra-orbital angles) is from two-fifths to a third the greatest breadth of the carapace.

Front well separated from the broad supra-orbital angles and cut into 2, 4, or 6 lobes or teeth, not including the supra-orbital angles.

Antero-lateral borders hardly oblique, forming almost a right angle with the frontal border, very little arched, cut into 5 teeth (including the outer orbital angle) of which the fourth is often rudimentary and sometimes absent.

Two sutures in the upper border of the orbit: a gap in the lower border, of which border the inner angle is seldom prominent. The antennules fold transversely.

Basal antennal joint having its outer angle enormously produced,

the process being in close contact with the whole length of the inner supra-orbital angle and completely filling the orbital hiatus, from which, therefore, the antennal flagellum is widely excluded.

Epistome sufficiently long: buccal cavern squarish, broader than long, the efferent branchial channels well defined.

Chelipeds and legs as in *Charybdis* (= *Goniosoma*). Abdomen as in *Neptunus*.

Obviously different as the extremes are, the forms included under *Charybdis* (= *Goniosoma*) and *Thalamita* yet constitute an unbroken series, and there is no one character, still less a combination of characters, by which the two groups can be sharply segregated.

Among Indian forms, however, even the most *Charybdis*-like *Thalamites* (e.g. *T. exetastica* and *imparimanus*) never have more than five distinct teeth on the antero-lateral border (though *T. exetastica* has a microscope accessory (6th) denticle on the first tooth), and always have a characteristic broadening of the inner supra-orbital angle; while the most *Thalamita*-like *Charybdes* (e.g. *C. investigatoris*) has the antero-lateral border cut into six distinct teeth and has a narrow inner supra-orbital angle.

### Key to the Indian species of the genus *Thalamita*.

- I. The extreme extent of the basal antenna-joint is far greater than the major diameter of the orbit:—
  - A. Front cut into six lobes of nearly equal size—exclusive of the broad inner supra-orbital angles:—
    1. Antero-lateral borders of carapace cut into five teeth of nearly equal size:—
      - i. Transverse ridges of carapace faint: outer surface of palms nearly smooth ..... *T. crenata*.
      - ii. Transverse ridges of carapace very distinct: outer surface of palms costate ..... *T. danaë*.
    2. Antero-lateral borders cut into five teeth, of which the 4th is much the smallest:—
      - i. Fourth tooth rudimentary: crest of basal antenna-joint with some large spines ..... *T. prymna*.
      - ii. Fourth tooth rudimentary: crest of basal antenna-joint smooth ..... *T. picta*.
      - iii. Fourth tooth small: basal antenna-joint granular ..... *T. stimpsoni*.

- B. Front cut into two lobes—*exclusive* of the broad inner supra-orbital angles:—
1. Inner supra-orbital angles arched, much narrower than either of the frontal lobes:—
    - i. Frontal lobes distinct and independent: hand covered with squamiform markings, its outer surface costate ..... *T. sima* [*T. arcuata*?]
    - ii. Median frontal notch indistinct: only the upper part of hand granular, its outer surface smooth or very indistinctly costate:—
      - a. Teeth of antero-lateral border of carapace acute, the last more prominent than the others ..... *T. poissonii* [? *T. sima.*]
      - b. Lobes of antero-lateral border square-cut, the last not enlarged ..... *T. chaptali.*
  2. Inner supra-orbital angles straight or little arched, not much narrower than either of the frontal lobes:—
    - i. Crest of basal antenna-joint smooth: 4th tooth of antero-lateral borders of carapace rudimentary.. ..... *T. integra.*
    - ii. Crest of basal antenna-joint granular, denticulate, or spinose:—
      - a. Crest granular or dentate: 4th tooth of antero-lateral borders rudimentary: fingers rather stumpy ..... *T. admeta.*
      - b. Crest granular or dentate: 4th tooth small: fingers sharp and as long as the palm ..... *T. savignyi.*
      - c. Crest spinose: 4th tooth somewhat smaller than the others: frontal lobes prominent, with their angles though rounded strongly pronounced..... *T. quadrilobata.*
- II. The extreme extent of the basal antenna-joint is equal to, or less than, the major diameter of the orbit:—
- A. Front cut into six lobes—*exclusive* of the inner supra-orbital angles:—
    1. Antero-lateral borders of the carapace cut into five teeth, of which the fourth is rudimentary:—



- i. All the frontal teeth clearly cut and on the same level, the middle pair much narrower than the submedian pair ..... *T. investigatoris.*
    - ii. The middle frontal teeth are not very clearly defined from, are on a lower plane and are not much narrower than, and are somewhat overlapped by the submedian pair ..... *T. imparimanus.*
  - 2. Antero-lateral borders cut into five teeth, of which the last two are much smaller than the others: all the frontal teeth clearly cut, the median on a lower plane and hardly narrower than the submedian pair..... *T. ezetastica.*
- B. Front cut into four lobes—*exclusive* of the inner supra-orbital angles :—
  - 1. Median lobes of the front narrower than the lateral lobes :—
    - i. Front sinuous, the median lobes more prominent than the others :—
      - a. Median frontal lobes moderately prominent: antero-lateral borders of carapace cut into five teeth, of which the 4th is the smallest ..... *T. sezlobata.*
      - b. Median frontal lobes conspicuously prominent: antero-lateral borders cut into four teeth, of which the 3rd is the smallest ..... *T. hanseni.*
    - ii. Front perfectly straight: antero-lateral borders cut into five teeth of which the 4th is the smallest ... *T. intermedia.*
  - 2. Median lobes of the front very much broader than the lateral lobes :—
    - i. Wrist with 3 sharp spinules on the outer surface, hand with granular costæ on outer surface, fingers about as long as the palm ..... *T. wood-masoni.*
    - ii. Outer surface of wrist and hand nearly smooth, fingers shorter than palm ..... *T. taprobanica.*
- C. Front cut into two lobes—*exclusive* of the inner supra-orbital angles :—
  - 1. Front very slightly convex, hardly prominent beyond the supra-orbital angles: carapace markedly transverse, its antero-lateral borders cut into five teeth of

- which the last 2 are very much smaller than the first 3 ..... *T. oculæa*.
- [2. Front convex and markedly prominent beyond the supra-orbital angles: carapace little transverse, its antero-lateral borders cut into five teeth of nearly equal size ..... *Thalamonyx gracilipes*].

*Thalamita prymna* (Herbst) Kossmann.

The following names are, in my opinion, all synonymous, namely:—*T. prymna*, *T. crenata*, *T. danæ*, *T. stimpsoni* and *T. picta*. But as it is only occasionally that one encounters specimens that show a combination or confusion of characters I prefer, for convenience, to consider the usually accepted species as distinct. I believe, however, that Kossman's view as to the specific identity of all the *Thalamitas* with an eight-lobed front combined with a very broad basal antenna-joint, untenable as that opinion appears at first sight, is the correct one.

46. *Thalamita crenata* (Latr.) Edw.

*Thalamita crenata*, Latr., Milne Edwards, Hist. Nat. Crust. I. 461: Guérin in Cuvier, Icon. Règne An. Crust. Texte p. 6 (*cor. Thalamita admète* Guérin, Icon. Règne An. Crust. pl. i. fig. 4): Rüppell, 24 Krabben roth. Meer. p. 6, pl. i. fig. 2: Krass, Sudafr. Crust. p. 25: Stimpson, Proc. Ac. Nat. Sci. Philad. 1859, p. 39: A. Milne Edwards, Archiv. du Mus. X. 1861 pp. 365, 367; Nouv. Archiv. du Mus. IV. 1868, p. 70 and IX. 1873, p. 166: Heller, SB. AK. Wien, XLIII. 1861, p. 356 and Novara Crust. p. 29: Martens, Verh. zool.-bot. Ges. Wien XVI. 1866, p. 381: Hilgendorf, MB. AK. Berl. 1878, p. 800: Hoffmann in Pollen and van Dam, Faun. Madagasc., Crust. p. 9: Lenz and Richters, Abh. senck. Ges. Frankf. XII. 1881, p. 422: Miers, Zool. H. M. S. Alert, pp. 184, 232, 518, 540; and Challenger Brachyura p. 199: Muller, Verh. Ges. Nat. Basel, VIII. 1876, p. 475: de Man, Journ. Linn. Soc., Zool., XXII. 1887-88 p. 79; and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 285; and Zool. Jahrb., Syst., &c., VIII. 1894-95 p. 569: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 218: Thallwitz, Abh. Zool. Mus. Dresden 1890-91, No. 3, p. 47: G. Pfeffer, Mitt. Naturhist. Mus. Hamburg, VII. 1890, No. 8, p. 7: Ortman, Zool. Jahrb., Syst., VII. 1893-94, p. 86; and in Semon's Beschnngsr. (Jena. Denk. VIII.) Crust. p. 46.

*Thalamita prymna* var. *crenata*, Richters in Möbius, Meeresf. Maurit. p. 153.

Carapace, length two-thirds the breadth, slightly convex, nearly smooth, crossed transversely by fine faint granular ridges—one, broken only by the cervical groove, between the last spines of the antero-ateral borders, one across the middle of the gastric region, and a series of four crescentic ridges (of which however the middle two are usually obsolete) defining the gastric region anteriorly.

Front cut into six rounded lobes of nearly equal size, not including

the arched inner supra-orbital angles each of which is as broad as any two of the true frontal lobes.

Antero-lateral borders cut into five clawshaped teeth of nearly equal size, or slightly decreasing in size from before backwards.

Posterior border of dorsal surface of carapace forming a curve with the postero-lateral borders, its length about one-third the greatest breadth of the carapace.

Orbits without any dorsal inclination, their major diameter about one-fifth the width of the interorbital space: the inner angle of their lower border dentiform and fairly prominent.

The basal antenna-joint is about two-ninths the greatest breadth of the carapace in extent, its orbital prolongation is in nearly the same straight line with its stem, and is traversed by a granular ridge.

Chelipeds a little unequal, the larger one in the male being about  $2\frac{1}{4}$  times the length of the carapace, with a nearly smooth surface. Anterior border of arm with 3 enlarged spines and some granules, posterior border with a few squamiform granules only. Inner angle of wrist stoutly dentiform, outer surface with three teeth imperfectly united by costæ. Hand with five spines (most of which are blunt and sometimes become obsolescent), in two rows, on the upper surface—those of either row being more or less connected by a ridge which is in part granular: there are no other distinct ridges on the hand except a faintish one in the neighbourhood of the immobile finger. The fingers of the larger hand are not quite as long as the somewhat swollen palm, those of the smaller hand are as long as their palm.

Legs smooth, unarmed except for the usual spine at the far end of the posterior border of the merus of the last pair and for 2 or 3 denticles (which, however, are often absent) on the posterior border of the propodite of the last pair.

The 6th abdominal tergum of the male is broader than long and has gently curved sides.

Large males in the Indian Museum collection have the carapace about 40 millim. long and about 60 millim. broad.

In the Indian Museum are 34 specimens, from the Andamans, Mergui, Bombay, Karachi and the Persian Gulf (besides specimens from Penang, Singapore, Australia, and Samoa).

#### 47. *Thalamita Danæ*, Stimpson.

*Thalamita crenata*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 282, pl. xvii. figs.

7 a-b.

*Thalamita Danæ*, Stimpson, Proc. Ac. Nat. Sci. Philad. (1858) 1859, p. 39: A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 366, 367, pl. xxxvi. fig. 1: Miers, Cat. Crust. New Zealand, p. 29: Hilgendorf, MB. Ak. Berl. 1878, p. 800: Richters

in Möbius Meeresf. Maurit. p. 153 : Tenison Woods, P.L.S., N. S. Wales, V. 1880-81, p. 118 : Filhol, Crust. New Zealand, Miss. de l'île Campbell, p. 382 : (?) de Man, Archiv. f. Naturges. LIII. 1887, i. p. 334; and Journ. Linn. Soc., Zool., XXII. 1887-88, p. 78 pl. iv. figs 8, 9; and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 285; and Notes Leyden Mus. XV. 1893, p. 285; and Zool. Jahrb., Syst., VIII. 1894-95, p. 569.

Differs from *T. crenata* in the following particulars:—

(1) the carapace is nearly three-fourths as long as broad, its posterior border is nearer two-fifths than a third its greatest breadth, its transverse ridges are very distinct, and the four crescentic ridges near the anterior limit of the gastric region are all prominent, especially the middle two:

(2) the front, though otherwise similar, is more prominent:

(3) a large part of the upper surface of the arm and wrist and at least the dorsal half of the surfaces of the hand are granular,—the granules being more or less squamiform; the ridges that connect the spines of the wrist are distinct; there are 6 or 7 costæ on the hand, and the spines of the hand are much sharper:

(4) the 6th abdominal tergum of the male is much broader than long, and its sides are divergent in two-thirds of their extent and then suddenly converge.

In the Indian Museum are 20 specimens from the Andamans and Mergui.

#### 48. *Thalamita prymna* (Herbst).

*Cancer prymna*, Herbst, Krabben, III. iii. 41, pl. lvii. fig. 2.

*Thalamita prymna*, Milne Edwards, Hist. Nat. Crust. I. 461 : Krauss, Sudafr. Crust. p. 25 : De Haan, Faun. Japon. Crust. p. 43, pl. xii. fig. 2 : A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 360, 367, and Nouv. Archiv. du Mus. IX. 1873, p. 163 : Hess, Archiv. f. Naturges. XXXI. 1865, i. pp. 140, 171 : Hoffmann, in Pollen and van Dam Faun. Madagasc. Crust. p. 9 : Kossmann, Crust. roth. Meer. p. 47 (part) : Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 108 : Neumann, Cat. Pod. Crust. Heidelb. Mus. p. 24 : de Man, Notes Leyden Mus. II. 1880, p. 180; and Archiv. f. Naturges. LIII. 1887, i. p. 333; and Journ. Linn. Soc. Zool. XXII. 1887-88, p. 75, pl. iv. figs. 5, 6; and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 285; and in Zool. Jahrb., Syst., VIII. 1894-95, p. 567 : Richters, in Möbius Meeresf. Maurit. p. 153 : Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 238; and Challenger Brachyura, p. 197 : Sluiter, Tijds. Nederl. Ind. XL. 1881, p. 162 : Haswell, Cat. Austral. Crust. p. 80 : Ortmann, Zool. Jahrb., Syst., VII. 1893, p. 84; and in Semon's Forschungsr. (Jena. Denk. VIII.) Crust. p. 46 : Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 372.

*Thalamita crassimana*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 85; and U. S. Expl. Exp. Crust. pt. I. p. 284, pl. xvii. figs. 9a-d : Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 39.

Differs from *T. crenata* in the following particulars:—

(1) the carapace is even less convex, and, as in *T. Danæ*, its trans-



verse ridges are very distinct, moreover the mid-gastric ridge is continued, following the curves of the orbits, to the notch between the 1st and 2nd spines of the antero-lateral borders :

(2) the front is somewhat more prominent, the teeth are closer set and the four middle ones are remarkably square-cut :

(3) the teeth of the antero-lateral border end in spines and the fourth tooth is quite rudimentary and may even be altogether absent :

(4) the basal antenna-joint is nearer a fourth than two-ninths the greatest breadth of the carapace in extent, and its orbital prolongation is traversed by a row of spines of which from 1 to 3 are large :

(5) except that they are free from hair and that all the spines are large and much more acute, the chelipeds are like those of *T. Danæ*, but the granules on the upper surface of the arm are less numerous, and the faint ridge that separates the lower and inner surfaces of the hand in *T. Danæ* is absent :

(6) the propodite of the last pair of legs has its posterior border serrated throughout :

(7) the 6th abdominal tergum of the male is about as long as broad, and has gently convergent sides.

In the Indian Museum are 35 specimens, from the Andamans, Nicobars, Mergui, and Madras coast (besides 1 from Samoa).

#### 49. *Thalamita picta*, Stimpson.

*Thalamita picta*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 39: A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 362, 367, and Nouv. Archiv. du Mus. IX. 1873, p. 164, pl. iv. fig. 4: Hilgendorf, MB. Ak. Berl. 1878, p. 800: Miers, Zool. H. M. S. Alert, pp. 518, 540: Cano, Boll. Soc. Nat. Napoli, III. 1889, p. 217.

Differs from *T. prymna* in the following slight particulars:—

(1) the basal antenna-joint is not so broad and its crest is tooth-like, having a smooth entire edge :

(2) the two middle frontal teeth project more than the others.

In the Indian Museum there is a single specimen from the Andamans.

#### 50. *Thalamita Stimpsoni*, A. M. Edw.

*Thalamita stimpsoni*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 362, 367, pl. xxxv. fig. 4, and Nouv. Archiv. du Mus. IX. 1873, p. 164: ? Tozzetti, Magenta Crust. p. 71, pl. v. figs. 4 a-f: Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 238; and Zool. H. M. S. Alert, pp. 184, 232; and Challenger Brachyura, p. 198: Tenison Woods, P. L. S. N. S. Wales, V. 1880-81, p. 118: Haswell, Cat. Austral. Crust. p. 80: Müller, Verh. Nat. Ges. Basel VIII. 1886, p. 475: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 217: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 85, and in Semon's Forschungrs. (Jena. Denk. VIII.) Crust. p. 46.

Differs from *T. prymna* in the following slight particulars :—

- (1) the basal antenna-joint has a row of granules, but no spines :
- (2) the inner supra-orbital angles are broader :
- (3) the 4th spine of the antero-lateral border is usually not so complete a rudiment.

In the Indian Museum is one specimen from the Andamans (besides others from Singapore, Hongkong and Australia.)

This, as Miers has remarked, is one of the forms that supports Kossmann's view as to the identity of all the preceding species of *Thalamita*.

### 51. *Thalamita Chaptalii*, Aud. et Savign.

*Portunus Chaptalii* Audouin, Explic. p. 83 Savigny Descr. Egypte Crust. pl. iv. fig. 1.

*Thalamita chaptalii*, Milne Edwards, Hist. Nat. Crust. I. 460 : A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 360, 367 : Miers, Zool. H. M. S. Alert, p. 231 (foot-note) : Cano, Boll. Soc. Nat. Napol. III. 1889, p. 216.

? *Thalamita sima*, Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 373.

Carapace two-thirds as long as broad, pilose, considerably convex, the transverse ridges distinct and disposed as in the preceding species except that there is an additional one running across the cardiac region and on to the branchial region on either side, its endings on the branchial regions being the most distinct part of its course.

Front proper forming a broad shallow arch grooved but not deeply divided in the middle line : the inner supra-orbital angles, which have their anterior border curved, are very much less wide than the frontal lobes proper.

Antero-lateral borders cut into five teeth, of which the fourth, though considerably smaller, and the fifth, though somewhat smaller than the other three, are quite well developed : the first three teeth are somewhat square-cut, the first being very distinctly so.

The posterior border of the dorsum of the carapace is straight but forms a curve with the postero-lateral borders, its length is slightly more than a third the greatest breadth of the carapace.

Orbits without any particular dorsal inclination, their major diameter about one-fourth the width of the interorbital space : the inner angle of the lower border is not pronounced.

The basal antenna-joint is between a fifth and a sixth the greatest breadth of the carapace in extent, and is traversed by a low smooth crest.

Chelipeds about  $2\frac{1}{4}$  times the length of the carapace : usually only two enlarged teeth—and those blunt—on the anterior border of the

arm, the posterior border and part of the upper surface granular: upper surface of wrist granular and costate, inner angle strongly spiniform, the usual spinules on the outer angle obsolescent. Hand rather full, upper surface granular, with the usual two parallel crests and five spines: the spines however are blunt and small, and the anterior two of the outer row are usually obsolete: except for a few indistinct costæ the other parts of the hand are smooth: the fingers are slightly longer than the hand, except in the larger cheliped of the adult male.

The merus of the last pair of legs is nearly twice as long as broad and has the usual spine on its posterior border: the same border of the propodite is smooth.

The sixth abdominal tergum of the male is a good deal broader than long and has the sides parallel or slightly divergent in at least two-thirds of their extent.

A small species: the largest male in the Indian Museum has the carapace 13 millim. long and a little less than 21 millim. in extreme breadth, and there are several egg-laden females a good deal smaller.

147 specimens from the Andamans (one take), besides several from Mauritius.

## 52. *Thalamita Poissonii*, Audouin et Savigny.

*Portunus Poissonii*, Audouin, Explic. p. 84 Savigny, Descr. Egypt. Crust. pl. iv. fig. 3.

*Thalamita Poissonii*, de Man, Notes Leyden Mus. II. 1880, p. 181: Cano, Boll. Soc. Nat. Napoli, III. 1889, p. 216.

Differs from *T. chaptalii* in the following particulars:—

(1) the teeth of the antero-lateral borders are acute, and the last tooth is more spiniform and more prominent than the others:

(2) the posterior border of the propodite of the last pair of legs is armed with 2 or 3 small spinules:

(3) the teeth on the anterior border of the arm are acute.

In the Indian Museum are two specimens from the Persian Gulf. I much doubt that this is distinct from *T. chaptalii*.

## 53. *Thalamita sima*, Edw.

*Thalamita sima*, Milne Edwards, Hist. Nat. Crust. I. 460: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 39: A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 359, 367; and Nouv. Archiv. du Mus. IV. 1868, p. 70, and IX. 1873, p. 163: Miers, Cat. Crust. New Zealand, p. 28; and P.Z.S. 1879, pp. 20, 32; and Zool. H.M.S. Alert, pp. 184, 231, 518, 539; and Challenger Brachyura, p. 195: Kossmann, Reise roth. Meer., Crust. p. 50: Tozzetti, Magenta Crust. p. 78, pl. vi. figs. 1 a-e: Hilgendorf, MB. Ak. Berl. 1878, p. 800: Tenison Woods, P.L.S. N.S. Wales, V. 1880-81, p. 118: Haswell, Cat. Austral. Crust. p. 80: Filhol, Crust. New Zealand, Miss. ile Campbell, p. 382: Muller, Verh. Nat. Ges. Basel, VIII. 1886, p. 475: ? de Man, Journ. Linn. Soc.,



Zool., 1887-88, p. 75, and Zool. Jahrb. Syst. VIII. 1894-95, p. 564: Cano, Boll. Soc. Nat. Napoli, III. 1889, p. 216: Walker, Journ. Linn. Soc., Zool., XX. p. 110: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 84, and in Semon's *Forschungsgr.* (Jena. Denk. VIII) Crust. p. 46: ? J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 373.

*Portunus (Thalamita) arcuatus*, De Haan, Faun. Japon. Crust. p. 43, pl. ii. fig. 2.

Differs from *T. Chaptalii* in the following particulars:—

(1) the front proper, though arched as a whole, is distinctly divided into two broad shallow lobes the rounded outer angles of which are very distinctly separated from the supra-orbital angles:

(2) the antero-lateral borders are cut into 5 acute teeth of which the last is decidedly the largest and most prominent:

(3) the inner angle of the lower border of the orbit is more prominent:

(4) the chelipeds are everywhere more granular, their under surface especially being covered with transverse squamiform markings: the small spines on the outer surface of the wrist are well marked: the hand is everywhere covered with transverse squamiform markings and is very distinctly 6 or 7-costate, and on its upper surface are 5 distinct spines, of which 4 are large and acute.

In the Indian Museum is a single specimen from the Persian Gulf (besides 12 from Hongkong and Nagasaki).

Our specimens are undoubtedly the *Thalamita arcuata* of De Haan, which, according to A. Milne Edwards is synonymous with *T. sima* of Milne Edwards.

#### 54. *Thalamita admeta* (Herbst) Edw.

*Cancer admete*, Herbst, Krabben III. iii. 40, pl. lvii. fig. 1.

*Portunus admete* Latr., Audouin Explic. p. 84, Savigny Descr. Egypt. Crust. pl. iv. fig. 4.

*Thalamita admete*, Cuvier Règne Animal Crust. pl. ix. fig. 2: Milne Edwards, Hist. Nat. Crust. I. 459: Krauss, Sudafr. Crust. p. 24: Dana, U. S. Expl. Exp. Crust. pt. I. p. 281, pl. xvii. figs. 5 a-c: Stimpson, Proc. Ac. Nat. Sci. Philad. 1853, p. 39: A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 356, 367; and Nouv. Archiv. du Mus. IX. 1873, p. 162: Heller, SB. Ak. Wien, XLIII. 1861, i. p. 355: and Crust. Sudl. Europ. p. 79, pl. ii. fig. 17. (*vide* Guérin); and Novara Crust. p. 28; Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 105: Hilgendorf, MB. Ak. Berl. 1878, p. 799: Richters in Möbius Meeresf. Maurit. p. 153: Miers, Zool. H. M. S. Alert, pp. 183, 230; and Challenger Brachyura, p. 194: Carus, Prod. Faun. Medit. p. 515, (*vide* Guérin): de Man, Archiv. f. Naturges. LIII. 1887, i. p. 332; and in Weber's Zool. Ergebn. Niederl. Ost.—Ind. II. 1892, p. 285: Thallwitz, Abh. Zool. Mus. Dresden 1890-91, No. 3, p. 46: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 83; and in Semon's *Forschungsgr.* (Jena. Denk. VIII) Crust. p. 46: J. R. Henderson, Trans. Linn. Soc. Zool. (2) V. 1893, p. 372: Whitelegge, Mem. Austral. Mus. III. 1897, p. 138.



*Thalamita savignyi*, A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 357 and 367, and Nouv. Archiv. du Mus. IX. 1873, p. 163: Kossmann, Reise roth. Meer. Crust. p. 49: de Man, Notes Leyden Mus. II. 1880, p. 180, and III. 1881, p. 99; and Journ. Linn. Soc. Zool. XXII. 1887-88, p. 73; and Zool. Jahrb., Syst. etc., VIII. 1894-95, p. 564: Cano, Boll. Soc. Nat. Nap. III. 1889, p. 215: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 372: Ortmann in Semon's Forschungsr. (Jena. Denk. VIII). Crust. p. 46.

Carapace only about five-ninths to three-fifths as long as broad, pilose, flat, crossed transversely by granular ridges which have the same disposition as in *T. danæ*, *crenata*, etc., except that, as in *T. chapatalii*, *simu* etc., there is an additional one across the cardiac region and extending, with an interruption, on to either branchial region.

Inter-orbital space divided into four square-cut lobes of nearly equal width: the middle two, which form the front proper, are laminar and are considerably the more prominent: the outer two, which are the broad inner supra-orbital angles, have a straight, or inappreciably curved anterior border.

Antero-lateral borders cut into 5 acute claw-like teeth, of which the 4th is much smaller than the others and is often rudimentary.

The posterior border of the dorsum of the carapace forms a curve with the postero-lateral borders: its length is a little less than a third the greatest breadth of the carapace.

The orbits have no particular dorsal inclination, their major diameter is about a fifth the width of the inter-orbital space, the inner angle of their lower border is bluntly dentiform.

Basal antenna-joint nearly a fourth the greatest breadth of the carapace in extent: its orbital extension traversed by a serrated crest.

Chelipeds unequal in the adult male. Three enlarged teeth on the anterior border of the arm: the posterior border granular in its distal half. Upper and outer surface of wrist costate and slightly granular, 2 or 3 spinules at the outer angle, the inner angle strongly spiniform. Hand full and deep, with 5 costæ on the upper and outer surfaces: on the upper two costæ are altogether 6 spines, of which the distal two are the smallest: the other surfaces of the hand are generally smooth, but there may be a faint bulge or ridge along the inner surface and an incomplete line of granules along the lower border. Fingers a good deal shorter than the hand (especially in the larger cheliped) rather stumpy, and though sharp-pointed showing an inclination to be channelled along the inner surface: the dactylus is decidedly hook-like.

In some individuals the hand, except for the two spinose costæ on the upper surface and for traces of two costæ on the outer surface, is quite smooth. In others there are only four distinct spines on the hand,—the two small ones immediately behind the finger-joint being

obsolescent. In the variety *savignyi* the hand is not particularly full or deep, and the fingers, which are as long as the hand, are not channelled along the inner surface.

The merus of the last pair of legs is nearly twice as long as broad and has the usual spine near the far end of the posterior border; the posterior border of the propodite of this pair is serrated throughout.

The 6th abdominal tergum of the male is not much broader than long, its sides are slightly but gradually convergent.

The carapace of an average male in the Indian Museum is 15 millim. long and 26 millim. broad, but there is a specimen much larger than this from the "South Seas."

In the Indian Museum are 45 specimens from the Andamans, Mergui, Palk Straits and Persian Gulf.

Three varieties of this species are recognizable, but the differences between them are very inconstant and are not, in my opinion, of specific value:—

(1) *Thalamita admeta* (Herbst). "Der Hand ist gross, auf der aussern Wölbung gekornt."

(2) *Thalamita admeta* A. M. Edw. "Main portant.....sur la face externe deux crêtes peu marquées et lisses."

(3) *Thalamita savignyi* A. M. Edw., which differs in the following particulars:—

(a) the transverse ridges of the carapace are in sharper relief: (b) the division between the 2 true frontal lobes is not always broad and deep: (c) the fourth tooth of the antero-lateral borders, though smaller than the others, is not rudimentary: (d) the hand is not particularly full and deep, and its inner surface is sometimes granular, all the granular costæ of the outer surface being well-marked also: (e) the fingers are straighter, are as long as the palm, and have no particular channelling of the inner surface.

#### 55. *Thalamita quadrilobata*, Miers.

*Thalamita quadrilobata*, Miers, Zool. H. M. S. "Alert," pp. 518, 539, pl. xlviii. fig. B; and Challenger Brachyura, p. 194.

Differs from *T. admeta* in the following particulars:—

(1) the carapace is not quite so broad, its length being about three-fifths its breadth:

(2) the two lobes that form the front proper project very much more beyond the two lobes that form the supra-orbital angles and their free edges are so concave and their angles therefore are so pronounced that the front (not including the supra-orbital angles) appears four-lobed:

(3) the fifth tooth of the antero-lateral borders though smaller than the others is by no means a rudiment:

(4) the crest of the basal antenna-joint is armed with a row of 3 large spines like those of *T. prymna*.

(5) the hands and fingers are like those of the *var. savignyi*: i.e., the hand is distinctly costate, some of its inner surface is granular, and the fingers are as long as the hand and have no particular channelling of the inner surface.

In the Indian Museum there is a single specimen from the Andaman Islands: the length of the carapace is 22 millim., its breadth 35 millim.

This form is probably only a variety of *T. admeta*.

#### 56. *Thalamita integra*, Dana.

*Thalamita integra*, Dana, Proc. Ac. Nat. Sci. Philad. VI. 1852, p. 85 and U. S. Expl. Exp. Crust. pt. I. p. 281, pl. xvii. figs. 6 *a-d*: Stimpson, Proc. Ac. Nat. Sci. Philad., 1858, p. 39: A. Milne Edwards, Archiv. du Mus. X. 1861, pp. 358, 367, and in Maillard's Île Réunion, Annexe F. p. 2: Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 107: Hilgendorf, MB. Ak. Berl. 1878, p. 799: Richters in Möbius Meeresf. Maurit. p. 153: Miers, Zool. H. M. S. Alert, pp. 518, 540, and Challenger Brachyura, p. 195: de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 74: Cano, Boll. Soc. Nat. Nap. III. 1889, p. 215: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 373: Whitelegge, Mem. Austral. Mus. III. 1897, p. 138.

Closely allied to *T. admeta* from which it can be recognized by the following characters:—

(1) the carapace is not quite so broad and is distinctly convex: it is bare of tomentum and the transverse ridges are much less distinct, the one that crosses the cardiac region being obsolescent or absent:

(2) the crest of the basal antenna-joint has a sharp entire edge:

(3) the surface of the chelipeds is smooth and polished: the costæ of the wrist are worn and in great part obliterated, and the usual 3 spines at the outer angle of this joint are indistinct blunt points: the hand is quite smooth; the inner border of its upper surface is crest-like and bears two teeth, there is a blunt tooth in the usual place in front of the apex of the wrist-joint, and in front of this are one or two blunt tubercles; there may also be a smooth ridge running along the distal two-thirds of the lower border of the hand:

(4) the 6th abdominal tergum of the male is much broader than long.

In the Indian Museum are two specimens—from Mergui and the Andamans (besides a "Challenger" duplicate from Honolulu).

#### 57. *Thalamita investigatoris*, n. sp.

Carapace about two-thirds as long as broad, covered with a velvet-

like pile, crossed by transverse ridges disposed as in *T. sima*, *admeta*, etc.—i.e., there is an additional ridge extending across the cardiac and neighbouring parts of the branchial regions—but they are all faint.

Front cut into six lobes (not including the inner supra-orbital angles) very similar to those of *Charybdis* (= *Goniosoma*) *callianassa*, i.e., the middle two are narrow rounded and more prominent than the others, the next on either side are broad, and the third on either side are very narrow and are subacute.

Antero-lateral borders straight, cut into 5 acute teeth (including, as usual, the outer orbital angles) of which the first 3 are large, the 5th very small, and the 4th a rudiment.

Posterior border straight, but forming a curve with the postero-lateral borders, its length hardly more than two-fifths the greatest width of the carapace.

Orbits large, their major diameter more than two-fifths the width of the interorbital space: the inner angle of the lower border not denticiform.

The basal antenna-joint is not equal to the major diameter of the orbit in its extreme extent: its crest is low and denticulated.

Chelipeds markedly unequal in the adult male, their upper surface with close-set vesicular granules: two or three enlarged spines on the anterior border of the arm, none on the posterior border: inner angle of wrist spiniform, two or three minute points on the outer angle: hand not costate, with only two distinct spines,—one being in front of the apex of the wrist-joint, the other, which is the larger, being some way behind the finger joint: [the other spines usually present in *Thalamita*, if present, are not distinguishable from the general granulation]. Fingers shorter than the hand, especially in the larger cheliped.

First 3 pair of legs long and slender, banded with brown. The merus of the last pair is more than twice as long as broad and has the usual spine on the posterior border: there are also a few spinules on the posterior border of the propodite of this pair.

Sixth abdominal tergum of male a good deal broader than long, its sides parallel in their proximal half and then suddenly converging.

A single male from off Ceylon, 34 fathoms.

A small species, the carapace being 8 millim. long, and 11.5 millim. broad.

#### 58. *Thalamita exetastica* n. sp.

Closely resembles *T. investigatoris*, from which it differs in the following particulars:—

(1) the median frontal teeth are on a lower plane than, and are almost as broad as, the submedian teeth:



(2) the teeth of the antero-lateral border gradually decrease in size from before backwards, the 4th and 5th being extremely small; moreover there is a tiny tooth cut in the base of the first, somewhat after the manner of *Goniosoma orientale*, but very much smaller:

(3) the carapace is three-quarters as long as broad, and the length of the posterior border is more than half the greatest breadth of the carapace:

(4) all surfaces of the chelipeds, except that part of the upper surface of the arm that is concealed by the carapace, are covered with transverse squamiform markings; the hand is costate and there are at least 4 distinct spines on its upper surface, two of which along the inner border are particularly large; the fingers are as long as the palm.

(5) the legs are not particularly long and slender; the merus of the last pair is about two-thirds as broad as long, and the posterior border of the propodite is smooth.

A mature female and a young male from off the Malabar coast, 26–31 fms.

A small species, the carapace being 9 millim. long and 12 millim. broad. It is more nearly related to *Oharybdis* (= *Goniosoma*) than is any other of these small *Thalamites* with reduced basal antenna-joint.

59. *Thalamita imparimanus*, n. sp.

Closely resembles *T. investigatoris*, from which it differs in the following particulars:—

(1) the transverse ridges of the carapace are prominent:

(2) the median frontal teeth are about as broad as, are on a lower plane than, and are to some extent overlapped by, the submedian teeth:

(3) the basal antenna-joint is quite *Goniosoma*-like, its greatest extent being less than half the major diameter of the orbit: its crest is almost indistinguishable:

(4) the chelipeds, though otherwise similar, have the inequality in the male even more marked and there are no points on the outer angle of the wrist that are distinct from the general granulation:

(5) the legs are even longer and slenderer, and the posterior border of the propodite of the last pair is smooth:

(6) the line of junction between the 6th and 7th abdominal terga of the male is concave instead of straight.

Three specimens from off the Ganjam coast, 35 fathoms.

The carapace of the largest is 7 millim. long and 10 millim. broad.

60. *Thalamita sexlobata*, Miers.

*Thalamita sexlobata*, Miers, Challenger Brachyura, p. 196, pl. xvi. fig. 2: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 373.

Carapace nearly three-fourths as long as broad, flattish, closely pilose, the transverse ridges distinct and disposed as in *T. sima*, *admeta* and *investigatoris*.

Front cut into 4 lobes (*not* including the supra-orbital angles) of which the middle pair are the narrowest and slightly the most prominent and on a slightly lower plane, while the outer pair are the broadest, being also broader than the arched supra-orbital angles from which they are separated by a distinct notch.

Antero-lateral borders cut into 5 teeth, of which the first is the largest and the fourth is a mere rudiment, while the fifth is sometimes smaller and sometimes larger than the third.

Posterior border of the usual shape, its length is nearly half the greatest breadth of the carapace.

Orbits large, with a somewhat dorsal inclination, their major diameter is about a third the width of the inter-orbital space: the inner angle of the lower border not dentiform.

Basal antenna-joint about equal to the major diameter of the orbit in extreme extent: its crest is low and either entire or finely granular.

Chelipeds pilose, covered with transverse squamiform markings. Two enlarged spines on the anterior border of the arm, none on the posterior border. Inner angle of wrist strongly spiniform, three spinules on outer angle. Hand costate, with 4 or 5 (usually 4) spines, of which the most conspicuous are the 2 along the inner border of the upper surface. Fingers of the smaller cheliped rather longer, of the larger cheliped rather shorter, than the hand.

First 3 pair of legs with transverse squamiform markings on the upper surface. In the last pair the merus is nearly twice as long as broad and has the usual spine on the posterior border, and the same border of the propodite is smooth.

Sixth abdominal tergum of male with arched sides, the tergum being broader than long and much broader at its base than at its far end, though the base is not quite the broadest part.

In the Indian Museum are 15 specimens, from the Arakan coast, Andamans, and Persian Gulf. The carapace of an egg-laden female is 9 millim. long and 12.5 millim. broad.

61. *Thalamita Hanseni*, n. sp.

Carapace two-thirds as long as broad, slightly convex, somewhat pilose, crossed by transverse ridges which have the same disposition as in *T. admeta*, *sealobata* etc.

Front deeply cut into 4 lobes (*not* including the inner supra-orbital

angles) of which the middle two are narrow rounded and prominent beyond the outer two which are broad: the latter are well separated from the supra-orbital angles, which are arched and are about the same breadth as the middle frontal lobes.

Antero-lateral borders cut into 4 acute teeth (*including* the outer orbital angles) of which the first and last are the largest.

Posterior border of dorsum of carapace straight, but forming a curve with the postero-lateral borders, its length is half the greatest width of the carapace.

Orbits large, their major diameter about two-fifths the width of the inter-orbital space, the inner angle of their lower border is not dentiform, and they have no particular dorsal inclination.

Basal antenna-joint less than the major diameter of the orbit in extreme extent, its crest is smooth.

Chelipeds of usual form: three spines on the anterior border of the arm, none on the posterior border, the distal half of the upper surface with squamiform markings: inner angle of wrist strongly spiniform, three spinules on the outer angle: hand with 5 spines, in the usual position, the two behind the finger-joint the smallest, there are 2 or 3 obscure costæ and some indistinct squamiform markings on the outer surface: fingers shorter than the palm, especially in the larger cheliped.

Legs slender: the merus of the last pair is more than twice as long as broad and has the usual spine on the posterior border, the same border of the propodite of this pair has 2 or 3 spinules.

6th abdominal tergum of male much broader than long, with gradually convergent sides.

Three specimens were dredged by a Danish Expedition off Trincomalee in 2 fathoms, and have been very kindly lent to me for examination by Dr. H. J. Hansen. The carapace of the largest specimen is 6 millim. long and 9 millim. broad.

## 62. ? *Thalamita intermedia*, Miers.

*Thalamita intermedia*, Miers, Challenger Brachyura, p. 196, pl. xvi. fig. 1: Ortmann, in Semon's *Forschungs.* (Jena. Denk. VIII.) Crust. p. 46.

"The carapace is broadly transverse, and is covered with a close, whitish pubescence, the transverse ridges which cross its dorsal surface are not more distinct than in *Thalamita admete* to which species and to *Thalamita savignyi*, *Thalamita intermedia* is nearly allied.

"Of the six lobes of the front the median are smallest, and separated by a narrow and rather deep incision, the submedian and lateral are subequal, the latter slightly overlapping the former; the lateral lobes project somewhat less than the others.



"The five spines of the antero-lateral margin are all well developed, but the three anterior are very slightly larger than the fourth and fifth.

"The basal antennal joint is very distinctly granulated; the maxillipeds present nothing remarkable.

"The chelipeds in the male are subequal, the merus or arm with three spines on its anterior margin, of which the two nearest to the distal extremity are largest; wrist with a strong spine on its inner margin and three small spinules on its outer surface, palm with three or four spines disposed alternately in two series, on its upper surface, and with three granulated ridges on its outer surface, between which are other granules, as in *Thalamita savignyi*; the fingers are somewhat shorter than the palm, and irregularly denticulated on their inner margins.

"The ambulatory legs slender and slightly compressed; the fifth legs shaped much as in *Thalamita admeta* and *Thalamita savignyi*, with a spine near the distal end of the inferior margin of the merus-joint, and with the inferior margin of the penultimate joint armed with a very distinct series of small spinules.

Colour (in spirit) pinkish-brown; pubescence whitish."

The above is Miers' description, which I have copied, as I am not perfectly sure of the identity of our specimen. It should be added that the basal antenna-joint is "*Goniosoma*"-like, its extreme extent being less than the major diameter of the orbit, and that the front is cut perfectly straight.

In the Indian Museum is a single egg-laden female from off Ceylon 34 fms. The carapace is 5.5 millim. long and 9 millim. in extreme breadth.

63. *Thalamita Wood-Masoni*, n. sp.

Carapace nearly three-fourths as long as broad, convex, crossed transversely by ridges, which have the same disposition as in *T. sima*, *T. admeta*, *T. investigatoris*, etc., and are all very distinct and straight.

Front cut into 4 rather obscurely marked lobes (*not* including the inner supra-orbital angles) of which the two middle ones are very broad and the two lateral ones very narrow: the inner supra-orbital angles, which are well arched, are broader than the lateral lobes of the front but much narrower than the median lobes.

Antero-lateral borders nearly straight, cut into 5 sharp teeth, of which the 4th is rudimentary and is visible only when the carapace is denuded of its close pile.

Posterior border of dorsum of carapace straight but forming a curve with the postero-lateral borders, its length is rather more than two-fifths the greatest breadth of the carapace.



Orbits without any particular dorsal inclination: their major diameter nearly a third the width of the inter-orbital space: the inner angle of the lower border not dentiform.

Basal antenna-joint about equal to the major diameter of the orbit in extreme extent, traversed by a low microscopically-granular crest.

Chelipeds rather pilose: the arm has 3 spines on the anterior border, none on the posterior border, the exposed part of its upper surface has some squamiform granules: wrist costate and granular, its inner angle spiniform, 3 sharp spinules on its outer angle: hand with numerous granular costæ, and with 5 sharp and very distinct spines in the usual position: fingers about as long as the hand in the smaller cheliped, shorter than the hand in the larger cheliped.

Merus of last pair of legs slender, more than twice as long as broad, with the usual spine on the posterior border: the posterior border of the propodite of the same pair has some spinules.

The 6th abdominal tergum of the male is a good deal broader than long, its sides are suddenly convergent near the distal end and its distal border is concave.

In the Indian Museum is a single specimen from the Andamans. Among the specimens kindly lent me for examination by Dr. H. J. Hansen of the Copenhagen Museum is a male from Paumban (Palk Str.).

A small species; carapace 9 millim. long, 12.5 millim. broad.

*Thalamita Wood-Masoni* var. *taprobanica*.

Differs from *T. Wood-Masoni*, type, much as *T. admeta* differs from var. *T. savignyi*:—

(1) the frontal lobes are deeper cut:

(2) the sculpture of the chelipeds is much less distinct: the squamiform markings on the arm wrist and hand, and the costæ of the wrist and hand are much worn; the spinules on the outer angle of the wrist are blunt and obsolescent; and the spines on the upper surface of the hand are small and blunt—the anterior two of the outer row being smaller and blunter than the others; the fingers are much shorter.

In the Indian Museum is a single specimen from Ceylon.

64. *Thalamita ocula* n. sp.

Carapace rather more than two-thirds as long as broad, closely and densely pilose. When denuded, the transverse ridges are prominent and more numerous than in any other Indian species, because besides the ridges found in *T. danæ* etc., and besides the additional ridge across the cardiac and neighbouring part of the branchial regions found in

*T. sima*, *admeta* etc., there is—behind all—another short ridge or linear tubercle on either branchial region.

Front proper straight, obscurely divided into 2 lobes (*not* including the inner supra-orbital angles) by a notch that needs looking for with a lens. The inner supra-orbital angles are arched and their breadth is not half that of either of the true frontal lobes.

Antero-lateral borders nearly straight, cut into 5 teeth, of which the first is the largest and the last two (which are co-equal) are very much smaller than any of the others.

Posterior border of dorsum of carapace straight, but forming a curve with the postero-lateral borders; its length is rather more than half the greatest breadth of the carapace.

Orbits with a distinctly dorsal inclination, large—their major diameter being little less than half the width of the inter-orbital space—the fissures in the upper border obscure, the inner angle of the lower border not dentiform.

Basal antenna-joint Goniosoma-like, its extreme extent being much less than the major diameter of the orbit, its crest low and smooth.

Chelipeds pilose, covered with transverse squamiform markings: 2 enlarged teeth on the anterior border of the arm, none on the posterior border: inner angle of wrist strongly spiniform, 2 or 3 inconspicuous denticles on the outer angle: hand costate, with 4 or 5 (usually 4) spines, of which only three (namely, the one in front of the apex of the wrist-joint and the two along the inner border of the upper surface) are visible to ordinary observation, the other 1 or 2 being lost in the general squamiform granulation.

Legs pilose, the first 3 pair with squamiform sculpture on the upper surface: in the last pair the merus is nearly twice as long as broad, and has the usual spine on its posterior border, and the propodite has a smooth posterior border.

Sternum with numerous transverse grooves—a sort of scutiform sculpture—most conspicuous in the male.

6th abdominal tergum of male a good deal broader than long, with gradually convergent sides.

7 specimens from off Ceylon, 28–34 fms., 1 from off Malabar coast 26–31 fms., 3 from the Andaman Sea.

A small species: the carapace of the largest egg-laden female is 9 millim. long and 13 millim. broad.

### Alliance III. *Podophthalmoida*.

#### PODOPHTHALMUS, Lamk.

*Podophthalmus*, Lamarck, Syst. Anim. sans. Vert. V. p. 152, and Hist. Nat.

Anim. sans. Vertebr. V. p. 255 : Latreille, Hist. Nat. Crust. VI. p. 53 : Leach, Zool. Miscell. II. p. 147 : Desmarest, Consid. Gen. Crust. p. 99 : Milne Edwards, Hist. Nat. Crust. I. 465 : De Haan, Faun. Japon. Crust. p. 10 : A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XIV, 1860, pp. 283, 228, and Archiv. du Mus. X. 1861, p. 419 : Miers, Challenger Brachyura, p. 207.

Carapace extremely broad. Its antero-lateral borders are almost transverse in the greater part of their extent and then turn obliquely backwards to end in a large spine ; they are deeply grooved along their whole extent to receive the enormously elongate eye-stalks. The groove is an extension of the true orbit, which also encroaches on the dorsal surface of the front, so that the true front comes to lie beneath the roots of the eye-stalks, cut off from the rest of the carapace except for a narrow isthmus left between the eye-stalks.

The true front, which thus lies below the eye-stalks but in its normal relation to the antennules and antennæ, is extremely narrow.

Close behind the spine that terminates the antero-lateral border is another, smaller, spine.

The eyes are borne on slender basal stalks of peculiar length : the orbits, as already explained, occupy the whole extent of the antero-lateral border, even extending on to the lateral epibranchial spine. The antennules are lodged in fossæ beneath the front, into which they are not completely retractile.

The antennæ are also in their normal position in the wide orbital hiatus : the basal joint is short, the flagellum long and slender.

The epistome though short, or even linear, and though encroached upon by the external maxillipeds, is well defined. Buccal cavern squarish broader than long : efferent branchial channels ill defined.

Chelipeds legs and abdomen as *Neptunus*.

As M. A. Milne Edwards has remarked *Podophthalmus* is merely an abnormal *Neptunus*.

#### 65. *Podophthalmus nacreus*, n. sp.

Carapace broadly hexagonal, approaching the oblong-quadrate, its length just over half its breadth (lateral spines included) its regions fairly well delimited, its surface finely granular.

Front proper (that is, the piece almost cut off from the rest of the carapace by the encroachment of the eye-stalks) horizontal, distinctly bilobed, its breadth about a sixth that of the carapace (spines included).

Antero-lateral borders distinctly arched, or angularly bent, the lower edge of the groove for the eye-stalks very prominent and forming almost a quadrant of a broad ellipse, the lateral epibranchial spine short—its length about half the width of the front.

Postero-lateral borders not at all strongly convergent, the spine at their anterior end sharply carinate. Posterior border straight, its length is half the greatest width of the carapace (spines included).

Eyes, with the eye-stalks, well over half the greatest breadth of the carapace (spines included).

The maxillipeds in repose almost close the mouth, a narrow space being left between them: the antero-external angle of the merus produced and lobe-like. Epistome almost linear.

Chelipeds in the male nearly three times the greatest length of the carapace: anterior border of arm with a row of spines the distal 2 of which are enlarged, posterior border with 2 enlarged spines in its distal half: inner angle of wrist strongly spiniform, a spine followed by a carina along the outer surface of wrist: hand very sharply carinated on the upper and outer surfaces, armed with 2 spines—one in front of the apex of the wrist-joint, the other behind the finger-joint: dactylus very little shorter than the palm.

First 3 pair of legs slender: a short spine on the posterior border of the merus of the 4th pair.

2nd and 3rd abdominal terga carinate in both sexes: 6th tergum in the male much broader than long, with converging sides.

Colours in spirit yellowish; the edges of the carapace, the crests and spines of the chelipeds, and the carinæ of the abdomen have much the same nacreous sheen as in *Neptunus argentatus*.

In the Indian Museum are 3 specimens from the Andamans, and one from the Gulf of Martaban 53 fms. The carapace of the largest specimen is 12 millim. long and 23 millim. broad.

This species in several respects approaches *Euphyllax*. It differs from *Podophthalums vigil* in the following particulars:—

(1) the carapace is almost oblong-quadrate, its antero-lateral borders are curved or angularly bent, its surface is granular and its regions better defined:

(2) the buccal cavern is squarer and is more nearly closed by the external maxillipeds, the antero-external angle of the merus of which is produced to form a lobule: the epistome is linear:

(3) the front is horizontal and bilobed:

(4) the lateral epibranchial spine is much shorter:

(5) the hand is very sharply carinated and the fingers are nearly as long as the palm.

### Family CANCRIDÆ.

*Canceriens arqués* (*Pseudocarcinus* and *Pirimela* only) Milne Edwards Hist. Nat. Crust. I. 371: and *Corystiens* (part) Milne Edwards, *op. cit.* II. 139.



*Cyclinea* and *Corystoidea* (part) Dana, U. S. Expl. Exp. Crust. pt. I. pp. 294 and 296 : Miers, Challenger Brachyura, pp. 208 and 209.

*Cancrini* (exc. *Carcinus*) and *Xanthini* (*Thiidae* only) Ortmann, Zool. Jahrb. Syst. VII. 1893-94, pp. 421 and 428.

Carapace moderately convex, either broadly transversely-oval (as in the *Cancrinæ*) or elongate-oval or subcircular or (rarely) somewhat hexagonal, the regions rarely strongly defined and rarely areolated.

Front not very broad, commonly cut into 3 teeth, which are sometimes prominent: [sometimes (*Thiinae*) the front is subentire or bilobed; in *Acanthocyclus* it is triangular and pointed.]

The antennules always fold longitudinally.

Antennal flagella usually long, coarse, and setaceous [absent in *Acanthocyclus*, short and slender in *Kraussia*].

Epistome usually sunken, always more or less overlapped by the external maxillipeds which are often somewhat elongate.

Legs gressorial.

Sternum narrow.

I propose to divide the Cancridæ into the following five subfamilies:—

Subfamily I. *Cancrinæ*. Carapace broadly transverse, oval, the antero-lateral borders cut into many teeth or puckers, the regions either not defined or fairly well defined and areolated. Front cut into 3 teeth. Buccal orifice about square. Epistome but slightly sunken and slightly overlapped by the external maxillipeds, which completely close the mouth and have the merus not elongate. Basal antenna-joint fixed.

Constituent genera:—

1. \**Cancer*, Lamk., Leach, A. Milne Edwards Nouv. Archiv. du Mus. I. 1865, p. 185.

2. *Metacarcinus*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 201.

3. *Trichocarcinus*, Miers, P.Z.S. 1879, p. 34 (= *Trichocera*, De Haan, Faun. Japon. Crust. p. 16).

Subfamily II. *Pirimelinæ*. Carapace somewhat hexagonal, not transverse, regions very well defined and areolated, antero-lateral borders cut into 5 teeth. Front cut into 3 teeth. Buccal orifice moderately elongate. Epistome a good deal sunken and much overlapped by the external maxillipeds which completely close the mouth. Basal antenna-joint fixed.

Includes a single genus, namely

\* *Pirimela*, Leach, Milne Edwards, Hist. Nat. Crust. I. 423.

Subfamily III. *Thiinæ*. Carapace subcircular the regions not defined, antero-lateral borders entire or denticulate. Front entire, or cut into two lobes which may again be subdivided into two lobules. Buccal orifice moderately elongate, the external maxillipeds, which completely cover the mouth, encroach somewhat on the very short epistome. Basal antenna-joint fixed.

Constituent genera :—

1. *Thia*, Leach: Milne Edwards, Hist. Nat. Crust. II. 143.
2. \**Kraussia*, Dana.

Subfamily IV. *Atelecyclinæ*. Carapace subcircular, often a little longer than broad, the regions usually fairly or well defined, not much areolated, antero-lateral borders usually with teeth. Front usually cut into 3 (sometimes 2 or 4) teeth which are often prominent. Buccal orifice elongate, not completely covered by the external maxillipeds which are elongate—especially as to their merus—and overlap or completely conceal the sunken epistome. Basal antenna-joint either fixed or slightly movable.

Constituent genera :—

1. \**Atelecyclus*, Milne Edwards, Hist. Nat. Crust. II. 141.
2. *Erimacrus*, Benedict Proc. U. S. Nat. Mus. XV. 1892, p. 229 (= *Podacanthus*, Brandt, Bull. Phys. Math. Acad. Petersb. VII. 1849, p. 180).
3. \**Hypopeltarium*, Miers, Challenger Brachyura, p. 210 (= *Peltarion*, Lucas in Jacquinot's Voy. Astrolabe au Pol. Sud., Zool. III. Crust. p. 80).
4. *Pliosoma*, Stimpson, Ann. Lyc. Nat. Hist. New York, VII. 1862, p. 227.
5. \**Telmessus*, White Ann. Mag. Nat. Hist. XVII. 1846, p. 497 and Samarang Crust. p. 14 (= *Platycorystes*, Brandt, Bull. Phys. Math. Acad. Petersb. VII. 1848, p. 179: = *Oheiragonus*, Latr.).
6. \**Trachycarcinus*, Faxon.
7. \**Trichopeltarium*, A. Milne Edwards.

Subfamily V. *Acanthocyclinæ*, carapace subcircular. Front ending in a triangular point. Epistome short sunken, completely concealed by the external maxillipeds which also completely cover the buccal orifice. Antennal flagella absent. For the single genus

*Acanthocyclus*, Milne Edwards and Lucas, Voy. Amer. Merid. Crust. p. 29.

[? Subfamily *Trichiinæ* for *Trichia* De Haan, Faun. Japon. Crust. p. 109, which may however be the type of a distinct family.]

In the foregoing lists the genera known to me by autopsy are marked with an asterisk and Indian genera are printed in Roman type. I have made no attempt to split the Subfamilies into "alliances" as I have not sufficient material at my disposal for such a purpose.

### Subfamily THIINÆ.

#### KRAUSSIA, Dana.

*Kraussia*, Dana, Silliman's Amer. Journ. Sci. and Arts. XIII. 1852, p. 120, and U. S. Expl. Exp. Crust. pt. I. p. 300.

Carapace not much broader than long, not concealing the first three abdominal terga even in the male, subcircular but with the antero-lateral borders much longer than the postero-lateral, and the latter rather strongly convergent and slightly concave: the regions not defined.

Front well separated from and prominent beyond the inner supra-orbital angles, almost horizontal, cut into two lobes which may, or may not, be again divided into two lobules.

The antennules fold alongside their basal joint, much nearer the longitudinal than the transverse.

The basal antenna-joint touches the front and occupies all the space between the antennulary pits and the orbit: the flagellum, which is short and slender, stands in the orbital hiatus.

Buccal cavern squarish, a little elongate: the external maxillipeds—of which the merus is not elongate—slightly overlap the epistome, which though short and sunken is well enough defined. No ridges on the palate to define the efferent branchial channels.

Chelipeds massive, short and stumpy with particularly stumpy fingers.

Legs short and stout, ending in blade-like dactyli.

The abdomen of the male consists of 5 segments, the 3rd-5th terga being fused.

Sternum narrow.

#### *Key to the Indian species of Kraussia.*

- I. Carapace somewhat broad, its frontal and antero-lateral borders conspicuously dentate: front bilobed ..... *K. integra*.
- II. Carapace somewhat elongate, its frontal and antero-lateral borders minutely denticulate: front four lobed ..... *K. nitida*.

#### 1. *Kraussia integra* (De Haan).

*Cancer (Xantho) integer*, De Haan, Faun. Japon. Crust. p. 66, pl. xviii. fig. 6.

J. 11. 13

? *Kraussia rastripes*, F. Müller, Verh. Ges. Basel. VIII. 1886, pp. 475, 480, pl. iv. fig. 5.

Carapace about four-fifths as long as broad, little convex, smooth to the naked eye, but with fine transverse subsquamiform pitting under the lens.

Frontal, orbital, and antero-lateral borders elegantly uniformly and conspicuously denticulate, and fringed (except the infra-orbital border) with long stiff silky hairs. Similar hairs fringe the legs, the arm and the inner angle of the wrist, and the anterior edge of the external maxillipeds.

Front cut into two broad lobes, each of which shows a very slight tendency to be divided into two lobules. Dorsal surface of roof of orbit without any marked grooves.

Chelipeds about as long as the carapace, the hand the most massive joint: the fingers are very short and stumpy, the dactylus closing very obliquely on a short straight immobile finger that is little better than a tubercle. On the outer surface of the hand is some fine subsquamiform sculpture: on the upper surface of the finger are some bluntly-dentiform granules in rows, and there are some granules near the inner angle of the wrist.

Legs stoutish, slightly shorter and much less massive than the chelipeds: the dorsad surfaces of the propodites and dactyli—as of the carpopodites also in their distal end—are abundantly and elegantly denticulate. All the dactyli are blade-like.

In the Indian Museum are two specimens from the Andamans.

## 2. *Kraussia nitida*, Stimpson.

*Kraussia nitida*, Stimpson. Proc. Ac. Nat. Sci. Philad. 1858, p. 40: Miers, Zool. H. M. S. Alert, pp. 184, 235: J. R. Henderson, Trans. Linn. Soc., (2) V. 1893, p. 379, pl. xxxviii. fig. 9.

Differs from *K. integra* in the following particulars:—

(1) The length of the carapace is more than four-fifths the breadth, and the carapace is more convex from side to side:

(2) The frontal, orbital, and antero-lateral borders are minutely, instead of conspicuously, denticulate, and the hairs that fringe them are more scanty:

(3) The front is more prominent and is cut into 2 lobes each of which is deeply cut into 2 lobules:

(4) There are two distinct though fine grooves in the roof of the orbit, one of which passes far back on to the carapace and imitates a cervical groove:

(5) The chelipeds are quite smooth except for a few granules at the inner angle of the wrist:



(6) The dactyli of the legs are more broadly blade-like, and the last three joints of the legs are without any denticulations or have only a trace of them on the propodite.

In the Indian Museum are two specimens one from the Andamans, 20 fms., the other from off the Ganjam coast, 9 fms.

### Subfamily ATELECYCLINÆ.

#### TEICHOPELTARIUM, A. M. Edw.

*Trichopeltarium*, A. Milne Edwards, Bull. Mus. Comp. Zool. VIII. 1880, p. 19.

Carapace oval or subcircular, as long as or longer than broad, strongly convex, its borders spinate.

Front prominent, not very broad, cut into 3 sharp teeth or spines.

Orbits shallow, defined by spines with considerable gaps between them: inner suborbital angle spiniform. Eye-stalks slender.

The antennules fold longitudinally. The basal antenna-joint is short and subcylindrical; the flagellum coarse, stout, setaceous.

Epistome of fair length, fairly well defined, sunken, and overlapped by the external maxillipeds. Buccal orifice square-cut, longer than broad, not completely covered by the external maxillipeds, which are somewhat elongate and have the merus a little narrower than the ischium. Efferent branchial regions defined by ridges which do not reach up to the epistome.

Chelipeds massive and unequal in the male.

Legs stout, hairy, more or less spiny, ending in stout styliform dactyli: they are longer and are not much less massive than the female chelipeds.

### 3. ? *Trichopeltarium ovale*, Anderson.

? *Trichopeltarium ovale*, Anderson, J.A.S.B. Vol. LXV. pt. 2. 1896, p. 103; Ill. Zool. Investigator, Crust. pl. xxv. figs. 4-4a: Alcock, Investigator Deep Sea Brachyura, p. 57.

Carapace egg-shaped, covered with spines which on its dorsal surface are bifid or multifid, and with short stiff but not very conspicuous hairs. The regions are well defined by coarse grooves: the gastric is divided into three sub-regions, and the cardiac into two, and on either side of the cardiac region a semilunar area is marked off on the branchial region.

The front, which is cut into three prongs, is about one-seventh the greatest breadth of the carapace, and is separated from the orbit by a deep notch.

The orbits are very incomplete: they are formed by a prominent

preocular tooth (parallel with, but less prominent than, the front), below which at the inner suborbital angle is an almost equally prominent coarse spine: there are also two other teeth—one at the external orbital angle, and the other between this and the preocular tooth—hardly distinguishable from the ordinary spines of the carapace. The eyestalks which are slender, tapering, and of good length, do not nearly fill the shallow orbital cavity.

The antennules fold longitudinally in fossæ, beneath the front: their basal joint is large. The antennæ arise almost in the same transverse line with the antennules: their basal joint forms a large part of the floor of the orbit.

The epistome is sunk below (*i.e.* is really arched much above) the plane of the external maxillipeds. The efferent branchial channels are defined by an incomplete ridge, and are patulous. The external maxillipeds are slender, and leave the mandibles exposed between them: the merus is obovate and narrower than the ischuim, the palp is coarse.

The chelipeds and legs are spiny and bristly, the spines in the case of the legs being well pronounced only on the dorsal surface of the meropodites.

In the female the chelipeds are shorter and not much stouter than the legs and are about as long as the carapace.

The legs are little unequal in length, the first pair which are slightly the longest being hardly half as long again as the carapace: they all end in long, stout, cylindrical, sharply styliform dactyli.

The abdomen of the female is seven-jointed and covered with coarse hairs: the first two segments are broader, and on them the spines decrease in size to the seventh segment which is smooth.

The colour in life is recorded by Dr. A. R. Anderson as pale bluish yellow.

Length of carapace and rostrum 64 millim., breadth 55.5 millim., depth 35 millim.

A single female from off the west coast of Ceylon 180–217 fms., on a foul bottom of broken coral.

#### TRACHYCARCINUS, Faxon.

*Trachycarcinus*, Faxon, Bull. Mus. Comp. Zool. XXIV. 1893, p. 156, and Mem. Mus. Comp. Zool. XVIII. 1895, p. 25: Alcock, Investigator Deep Sea Brachyura, p. 58.

“Carapace pentagonal, moderately convex, lateral margins long, nearly straight, toothed. Front narrow, produced, three-toothed. Orbits large with forward aspect, imperfect, with two hiatuses above

one below, and one at the inner angle; lower wall formed chiefly by the carapace. Anterior margin of buccal cavity not distinctly defined, epistome short, ridges of the endostome developed. Sternum long and rather narrow. Abdomen of male narrow and five-jointed, the third, fourth, and fifth segments consolidated. Eye-stalks very small, retractile within the orbits. Antennules longitudinally folded. The antennæ lie in the inner hiatus of the orbit; their basal segment is but slightly enlarged, not filling the hiatus at the inner angle of the orbit nor attaining to the front, subcylindrical, unarmed, imperfectly fused with the carapace; the second segment is longer and slenderer than the first, the third segment about equal to the second in length, but slenderer; all these segments are furnished with long and coarse setæ; the whole antenna is less than one-half as long as the carapace. The ischium of the outer maxillipeds is produced at its antero-internal angle; the merus of the same appendages is rounded at the antero-external angle, obliquely truncated but not emarginated at the antero-internal angle, where it articulates with the following segment. Legs of moderate length. Right and left chelipeds very unequally developed in the male. Dactyli of ambulatory legs styliform, straight slender, longer than the penultimate segments."

#### 4. *Trachycarcinus glaucus*, Alcock and Anderson,

*Trachycarcinus glaucus*, Alcock and Anderson, Ann. Mag. Nat. Hist. Jan. 1899, p. 8: Alcock, Investigator Deep Sea Brachyura, p. 59, pl. ii. fig. 2.

Carapace irregularly pentagonal, its surface coated with short stiff club-shaped hairs; the regions well defined, rather tumid, much subdivided into tumid lobules, of which the convexities are capped by clusters of large conical granules and the general surface also is studded especially in the young with similar granules.

Front narrow, horizontal, prominent, deeply cleft into three prongs of nearly equal size.

Antero-lateral borders half as long again as the postero-lateral, armed with three stout pinnulate spines not including the outer orbital angle: postero-lateral borders entire, posterior border finely beaded.

Upper orbital wall deeply cleft into three pinnulate teeth, lower orbital border deeply concave, its inner angle strongly spiniform. Eye-stalks slender, rather long: the eyes, which are more ventral than terminal, are dull and faintly pigmented (as in many species of *Munidopsis*), and are non-facetted.

Antennal flagella short, extremely slender, not hairy.

Chelipeds remarkably unequal in the male, equal in the female.

The smaller cheliped of the male and both chelipeds of the female

are about as long as the carapace, and are coated, almost to the fingertips, with stiff club-shaped hairs, which are short except along the upper border of the wrist and hand and of the basal part of the finger, where they are long: beneath the hairs are some scattered granules, and along the upper border of the arm, wrist and hand are some denticles: the inner angle of the wrist is strongly spiniform, and the far end of the upper border of the hand is dentiform.

The larger cheliped of the male is about twice the length of the carapace, about half its length being formed by the hand and fingers: the greatest breadth of the hand is about half the length of the carapace. It is almost smooth, the upper border of the arm and hand, and the inner border and upper and outer surfaces of the wrist, alone being furnished with denticles and hairs: the inner angle of the wrist is spiniform.

The legs are covered with short stiff club-shaped hairs which are rather more thick-set on the anterior borders and on the dactyli than elsewhere. The second and third pair, which are rather longer than the first and last pair are somewhat less than  $1\frac{2}{3}$  times the length of the carapace. All the dactyli end in a little claw.

The abdomen of the male consists of seven distinct segments, but the 3rd, 4th and 5th move together.

In life the animal is covered with a coat of mud held together by the hairs above described, the only bare parts being the hand and fingers and part of the arm of the larger cheliped of the male.

The colours in life are described by Dr. A. R. Anderson, as "white with a bluish tinge, eyes with a slight reddish opalescence." In spirit the bluish tinge is fainter, the eyes are a pale milky yellow-ochre, and the large hand is ivory-white.

The dimensions of the largest male are as follows:—

Length of carapace ...	...	...	...	18.5 millim.
Breadth of carapace ...	...	...	...	14.5 "
Combined length of hand and fingers, along lower border...				14.75 "
Combined length of basal joints, arm and wrist, along upper border ...	...	...	...	15 "

Fifteen specimens were dredged off the Travancore coast at a depth of 430 fms. The bottom consisted chiefly of coral (living and dead).

Several of the specimens were egg-laden females. The eggs are comparatively few in number and are large, their diameter being about 1.3 millim.

This species is very like *Trachycarcinus corallinus*, Faxon, which was dredged by the "Albatross" off Panama and the Pacific coast of Mexico, at depths of 546–695 fathoms.



It differs from that species in the following particulars :—

The carapace is more granular, and its lobules are capped by blunt conical spinules, *not* smooth tubercles ; and its posterior border is finely and irregularly beaded, *not* dentate.

The front is deeply cut into 3 spines or prongs of almost equal size, *not* into 3 teeth of which the middle one is larger than the others.

The eyes, though very pale, are distinctly pigmented, *not* devoid of pigment.

The inner angle of the wrist of the smaller cheliped is very strongly spiniform, *not* unarmed.

As Mr. Faxon says, *Trachycarcinus* is very closely related to *Trichopeltarium* ; in fact, the relation is so close as to make the separation of the two forms almost doubtful.

### Family CORYSTIDÆ.

*Corystiens* (part) Milne Edwards, Hist. Nat. Crust. II. 139.

*Corystoidea-Corystidæ* (part) Dana, U. S. Expl. Exp. Crust. pt. I, p. 296.

*Corystoidea* (part) Miers, Challenger Brachyura, p. 210.

*Majoidea-Corystoidea*, Ortmann, Zool. Jahrb., Syst., VII. 1893, pp. 26, 28.

*Ozyrhyncha-Corystidæ*, Ortmann, in Bronn's Thier Reich. V. ii. (Arthropoda), p. 1166.

Carapace much longer than broad, oval, convex from side to side, the regions sometimes fairly well defined, sometimes not, never areolated.

Front fairly prominent, cut into 2 or 3 teeth.

The antennules are small and fold longitudinally.

The antennæ, when present and perfect, usually have the flagellum long coarse and setaceous.

There is no epistome, and the external maxillipeds, which are elongate and sometimes have a slight pediform cast, extend almost up to the antennules. The buccal orifice is elongate and is square cut with the anterior angles rounded and slightly convergent.

Legs either all gressorial or the last pair modified for swimming.

The following genera compose this family :—

I. *Genera in which the legs are not natatory* :—

1. *Bellia*, Milne Edwards, Ann. Sci. Nat. (3) IX. 1848, p. 192.

2. *\*Corystes*, Latr., Milne Edwards, Hist. Nat. Crust. II. 146.

3. *Corystoides*, Edwards and Lucas, Voy. Amer. Merid., Crust. p. 31.

4. *Gomezia*, Gray, Zool. Miscell. p. 39, Miers, Challenger Brachyura, p. 212 (= *Oeidia*, De Haan, Faun. Japon. Crust. p. 15).

5. *Podocatactes*, Ortmann, Zool. Jahrb., Syst., VII. 1893, p. 29.

II. *Genera in which the legs are more or less natatory* :—

6. *\*Nautilocorystes*, Milne Edwards, Hist. Nat. Crust. II. 149 (= *Dicera*, De Haan, Faun. Japon. Crust. p. 14).

7. *Pseudocorystes*, Milne Edwards, Hist. Nat. Crust. II. 149.

## NAUTILOCORYSTES, Edw.

*Nautilocorystes*, Milne Edwards, Hist. Nat. Crust. II. 149.

*Dicera*, De Haan, Faun. Japon. Crust. p. 14.

Carapace elongate-obovate, slightly convex from side to side, smooth without distinction of regions, the antero-lateral borders longer than the postero-lateral and armed with five teeth.

Front moderately broad, horizontal, moderately prominent, cut into 2 or 3 teeth.

The antennules fold longitudinally. Antennæ coarse, setaceous, the basal joint occupying the orbital hiatus, the flagellum about half as long as the carapace.

Buccal orifice elongate subquadrate, not defined anteriorly: external maxillipeds elongate, the merus narrower than the ischium and bearing the flagellum at its summit. Even in repose the external maxillipeds partly conceal the antennules.

Chelipeds short, much more massive than the legs.

Legs compressed, the first 3 pair end in a lanceolate dactylus the last pair end in a blade-like swimming dactylus.

1. *Nautilocorystes investigatoris*, n. sp.

Carapace elongate-obovate covered with a multitude of fine brown longitudinal lines, smooth.

Front about a third the greatest breadth of the carapace, slightly prominent beyond the orbits, cut into 3 teeth.

Antero-lateral borders cut into 5 irregularly disposed teeth including the outer orbital angle.

Inner angle of lower border of orbit acutely dentiform, prominent beyond the level of the front.

Chelipeds equal, about as long as the carapace: a spine at the inner angle of the wrist and two spines on the upper surface of the hand—one being in front of the apex of the wrist-joint the other behind the finger-joint.

Legs compressed, much slenderer but not much shorter than the chelipeds, hairy: the dactylus of the last pair is broadly blade-shaped as in *N. ocellatus*.

In the Indian Museum are 2 females—one with eggs—from the Vizagapatam coast 15–17 fms. The carapace is 6.25 millim. long and 5.5 millim. broad.

This species differs from *N. ocellatus* in the following particulars:—the front is 3-spined, the inner suborbital angle is extremely prominent and spiniform, there are two spines on the hand, and the colour-markings are fine longitudinal lines.

---